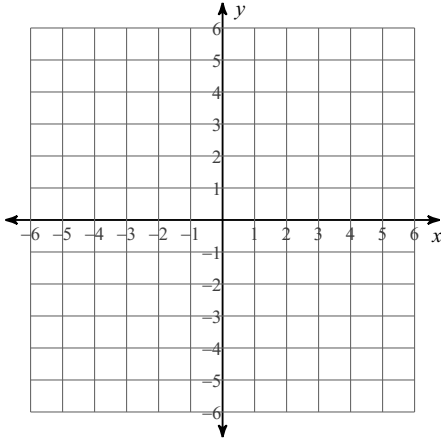


Summer Work

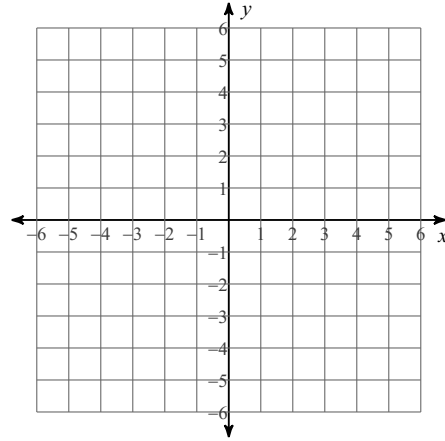
Date _____ Period _____

Sketch the graph of each line.

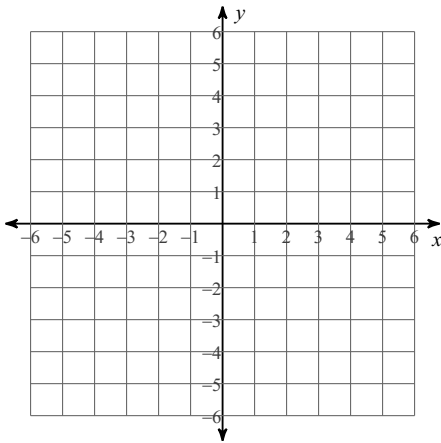
1) $x - 4y = -8$



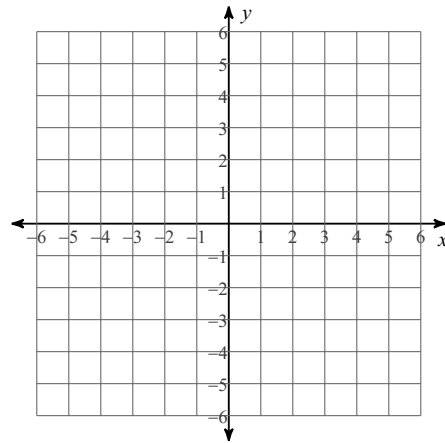
2) $5x - 4y = 8$



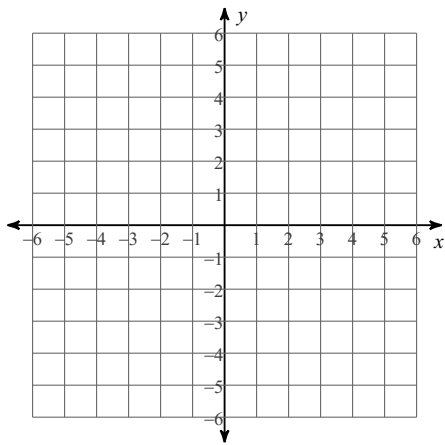
3) $2x - 5y = 25$



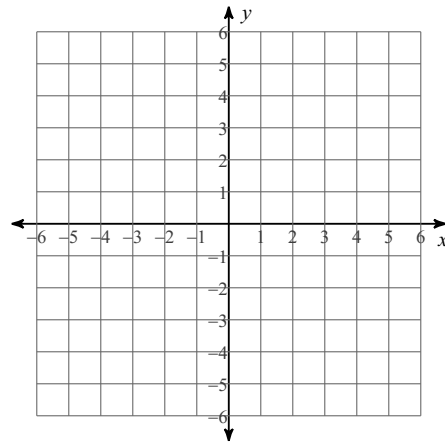
4) $x = -3$



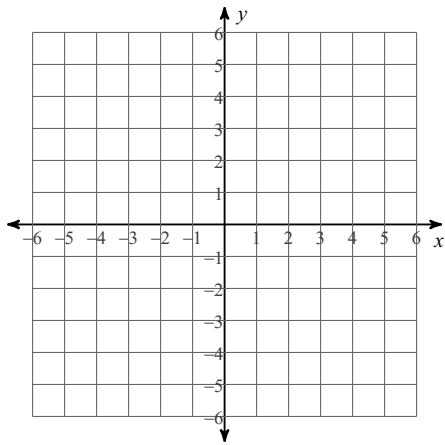
5) $y = -2x + 5$



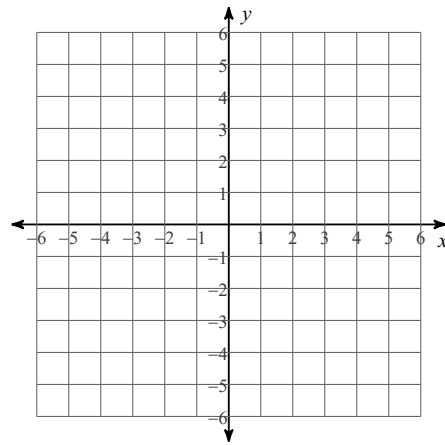
6) $y = \frac{2}{5}x + 1$



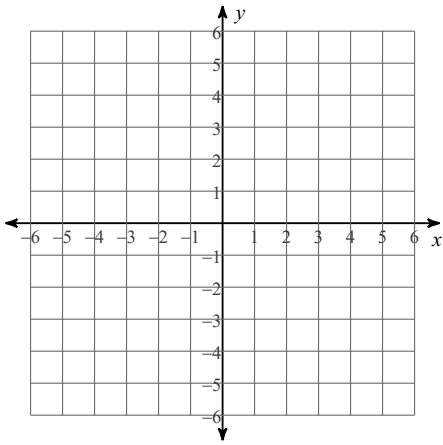
7) $-2y = 0$



8) $x - 2 = y$

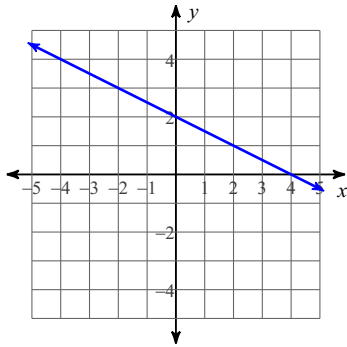


9) $2y = -8 - 3x$

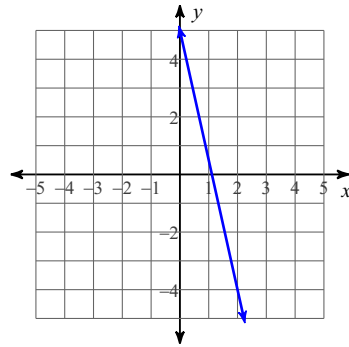


Write the slope-intercept form of the equation of each line.

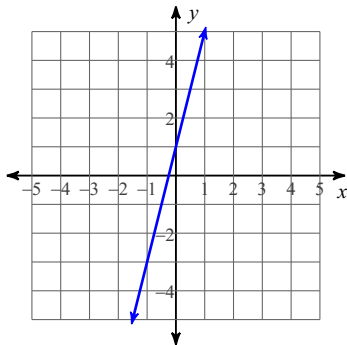
10)



11)



12)



Write the slope-intercept form of the equation of the line through the given point with the given slope.

13) through: $(-5, -1)$, slope = $\frac{4}{5}$

14) through: $(1, -3)$, slope = 2

15) through: $(-3, 4)$, slope = $-\frac{2}{7}$

Write the standard form of the equation of the line described.

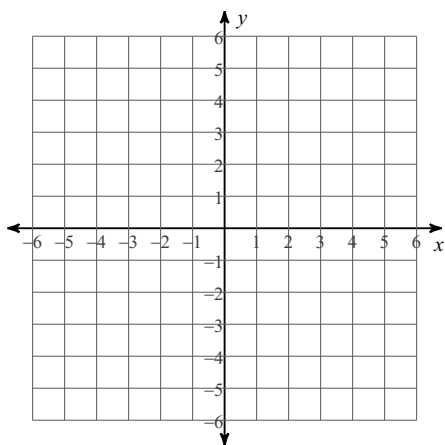
16) through: $(2, -4)$, perp. to $y = \frac{2}{9}x - 4$

17) through: $(-1, -5)$, perp. to $y = \frac{4}{5}x + 3$

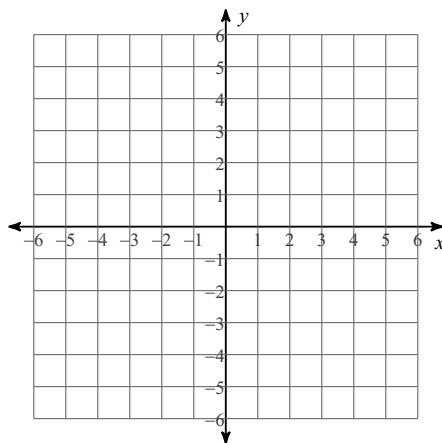
18) through: $(4, -2)$, perp. to $y = \frac{2}{5}x - 1$

Sketch the graph of each linear inequality.

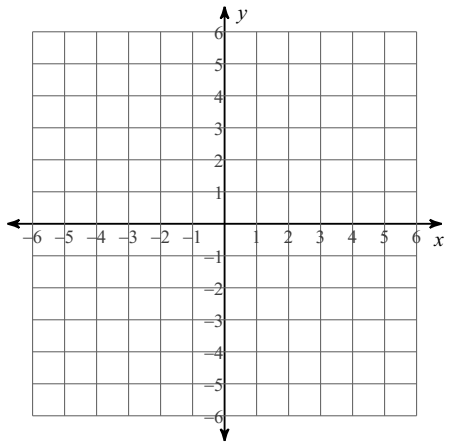
19) $y \leq -\frac{1}{3}x$



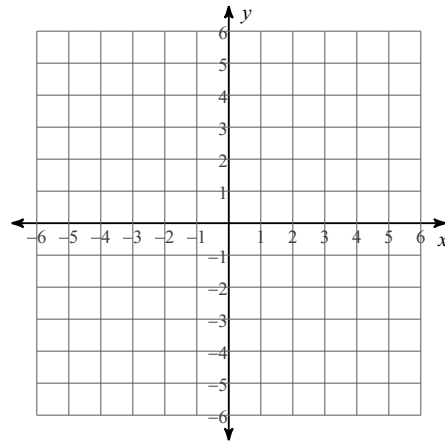
20) $y > 2x - 5$



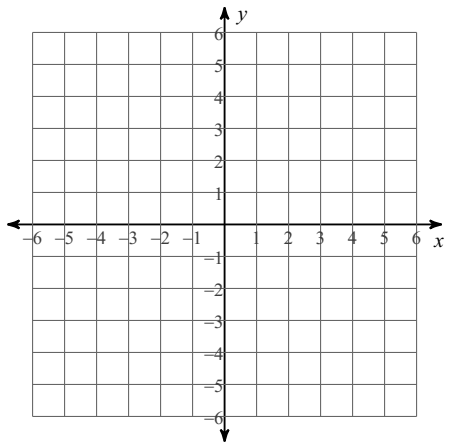
$$21) y \leq \frac{1}{4}x + 5$$



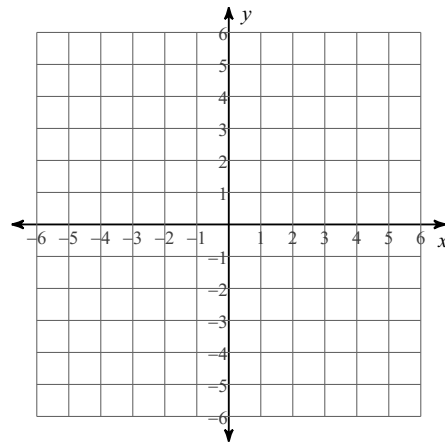
$$22) y > -2x - 5$$



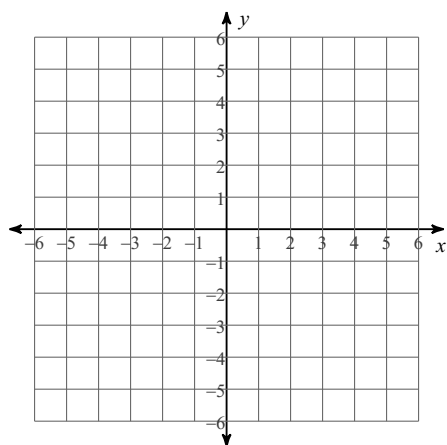
$$23) x < -2$$



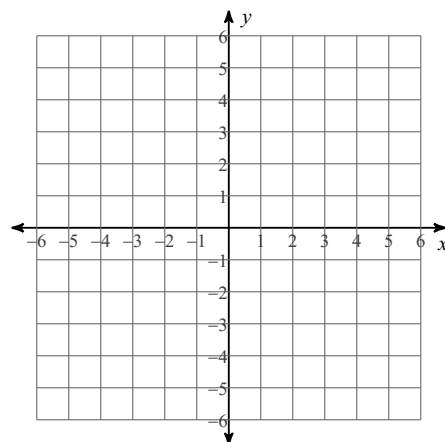
$$24) y \geq 3x + 4$$



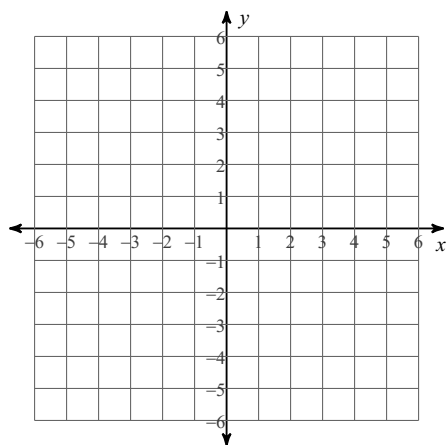
25) $y > 3x - 1$



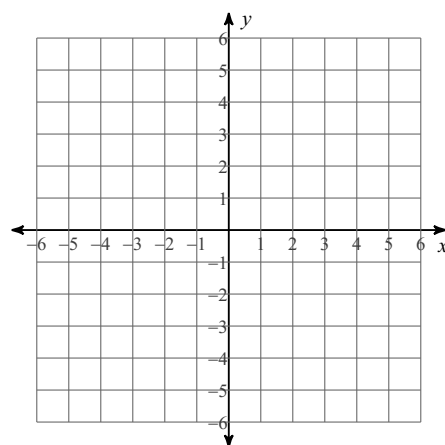
26) $y < -\frac{7}{4}x - 2$



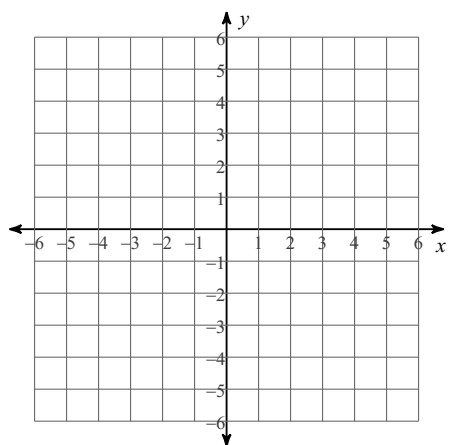
27) $y > -3x - 1$



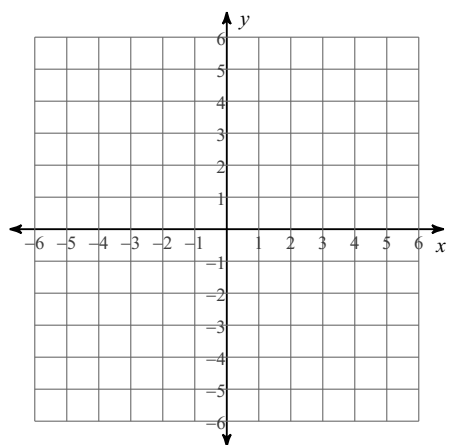
28) $y \leq -\frac{1}{2}x - 3$



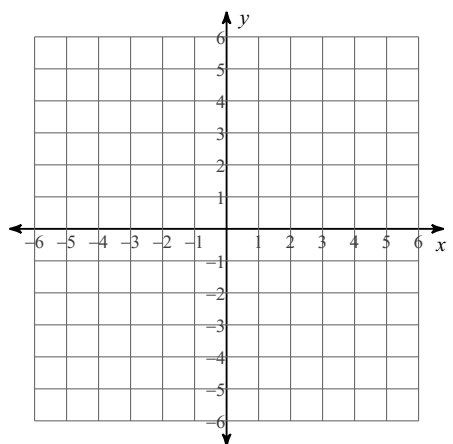
29) $x + y \leq 5$



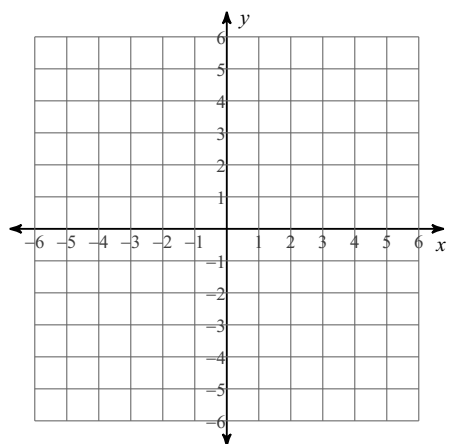
30) $7x + 2y < 10$



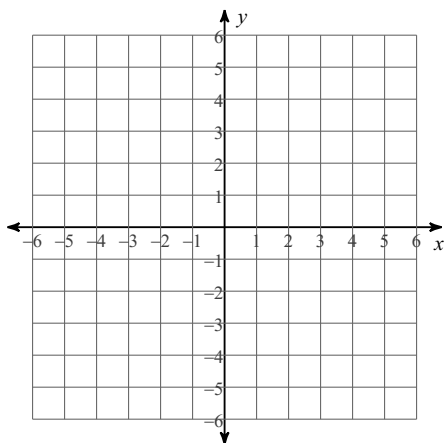
31) $y < 0$



32) $x + y \geq 1$



33) $4x - y > 1$



Solve each system by elimination.

34) $-10x + 3y = 27$
 $-6x + y = 17$

Solve each system by substitution.

35) $2x + y = -16$
 $-2x - 6y = 16$

Factor each completely.

36) $8x^3 - 5x^2 + 40x - 25$

37) $21r^3 - 7r^2 - 6r + 2$

38) $24r^3 - 64r^2 - 15r + 40$

39) $9uv - 24u - 3v + 8$

40) $2uv + 7u - 6v - 21$

41) $4xy + 6x^2 - 16y^3 - 24y^2x$

42) $48n^3 + 16n^2 + 36n + 12$

43) $8a^3 - 32a^2 + 4a - 16$

44) $10x^3 - 20x^2 + 6x - 12$

Factor each.

45) $x^6 + 7x^3 - 8 = 0$

46) $x^8 - 20x^4 + 64 = 0$

47) $x^8 - 5x^4 + 4 = 0$

48) $x^8 - 2x^4 + 1 = 0$

49) $x^8 - 124x^5 - 125x^2 = 0$

50) $x^6 - 1 = 0$

51) $8x^6 - 217x^3 + 27 = 0$

52) $4x^6 + 20x^4 - 25x^2 - 125 = 0$

53) $5x^6 - 2x^4 - 45x^2 + 18 = 0$

54) $27x^7 + 208x^4 - 64x = 0$

55) $27x^6 + 215x^3 - 8 = 0$

56) $9x^8 - 97x^4 + 144 = 0$

57) $25x^3 - 10x^2 + 15x - 6 = 0$

58) $64x^8 - 52x^4 + 9 = 0$

59) $6x^4 - 29x^2 + 9 = 0$

60) $15x^4 - 41x^2 + 28 = 0$

61) $225x^8 - 109x^4 + 4 = 0$

62) $225x^8 - 181x^4 + 36 = 0$

63) $4x^6 - 8x^4 - 9x^2 + 18 = 0$

64) $16x^8 - 257x^4 + 16 = 0$

65) $27x^6 + 98x^3 - 125 = 0$

66) $5x^2 + 6x - 8 = 0$

67) $3x^4 - 5x^2 - 8 = 0$

68) $x^6 - 64 = 0$

69) $x^2 - x - 20 = 0$

70) $x^3 + 5x^2 - 5x - 25 = 0$

71) $x^3 + 5x^2 + x + 5 = 0$

72) $x^3 - 4x^2 + 2x - 8 = 0$

73) $x^4 + 4x^3 + 3x^2 = 0$

74) $x^6 - 64 = 0$

Factor each completely.

75) $m^2 - 16$

76) $k^2 + 8k + 16$

77) $b^2 - 9$

78) $m^4 + 2m^2 + 1$

79) $x^4 + 6x^2 + 9$

80) $x^4 - 9$

81) $x^6 - 4$

82) $k^6 - 25$

83) $x^6 + 6x^3 + 9$

84) $6x^6 + 24x^3 - 270$

85) $x^6 - 5x^3 - 36$

86) $4x^6 + 44x^3 + 120$

87) $-2x^6 - 11x^3 + 21$

88) $28a^8 - 184a^4 - 84$

89) $12x^6 - 68x^3 + 80$

90) $150x^6 + 270x^3 + 108$

91) $40x^6 + 70x^3 - 75$

92) $16a^6 - 48a^3 + 35$

Solve each equation by factoring.

93) $p^2 = -p$

94) $n^2 - 6n = -8$

95) $m^2 = -3m$

96) $a^2 - 5a = -6$

97) $x^2 = -2x$

98) $x^2 - 3x = 40$

99) $5n^2 = -10n$

100) $7x^2 = 7$

101) $3n^2 = -45n - 168$

102) $k^2 - 3k = 28$

103) $2n^2 + 20n = -32$

104) $x^2 = -14 + 9x$

105) $10n^2 - 9n - 15 = -8$

106) $6x^2 + 17x + 26 = 3x^2 + 6$

107) $5k^2 - 25 = 7 + 12k$

108) $7n^2 + 93n = -8n^2 + 84$

109) $4b^2 + 15 = 28b - b^2$

110) $14p^2 - 21p - 20 = 6p$

Find the discriminant of each quadratic equation then state the number and type of solutions.

111) $-5n^2 + n - 8 = 0$

112) $4b^2 + 4b + 1 = 0$

113) $6v^2 - 7v + 1 = 0$

114) $8m^2 + 8m + 2 = 0$

115) $-3n^2 - 6n - 3 = 0$

116) $-2m^2 + 4m - 5 = 0$

Solve each equation by completing the square.

117) $x^2 + 6x - 95 = -4$

118) $p^2 + 6p - 47 = 8$

119) $n^2 - 8n - 31 = 2$

120) $n^2 - 20n - 40 = 7$

121) $m^2 - 20m - 47 = -3$

122) $a^2 + 14a - 101 = -6$

Solve each equation by factoring.

123) $v^2 = -5v$

124) $k^2 = -5 + 6k$

125) $v^2 + 6v = 16$

126) $x^2 - 3x = 10$

127) $m^2 = -2m$

128) $a^2 - 3a = 18$

Solve each equation by taking square roots.

129) $7p^2 - 6 = -112$

130) $64a^2 - 4 = 12$

131) $9n^2 + 1 = 37$

132) $-2 - 7b^2 = -93$

133) $8x^2 - 10 = 790$

134) $7m^2 - 5 = 303$

Solve each equation with the quadratic formula.

135) $9p^2 = 12p + 18$

136) $12k^2 = 8 - 9k$

137) $7x^2 = -5$

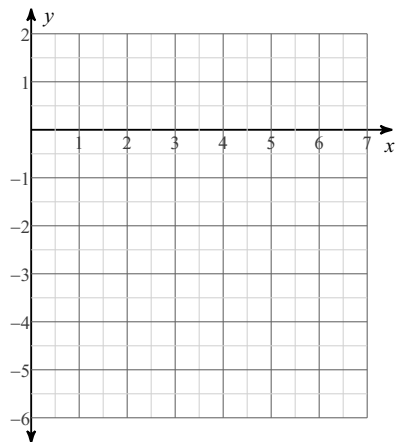
138) $3a^2 - 8 = 0$

139) $2x^2 = 20$

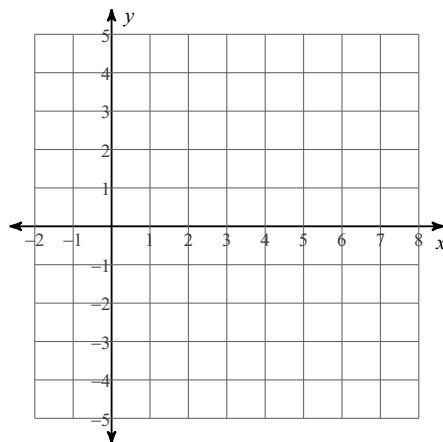
140) $2a^2 + a = 136$

Sketch the graph of each function.

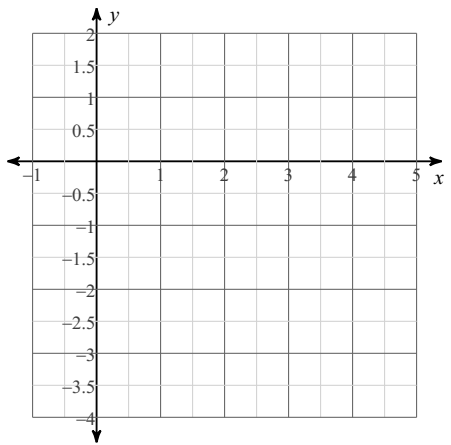
141) $y = (x - 4)^2 - 4$



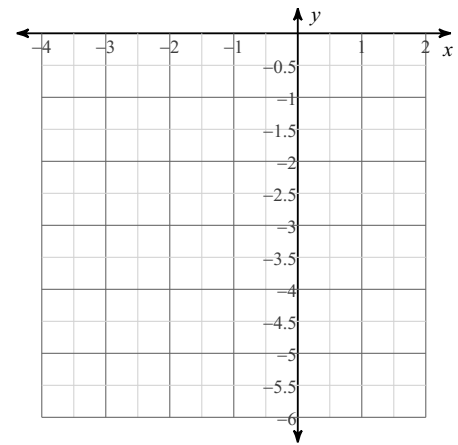
142) $y = 2(x - 3)^2 - 4$



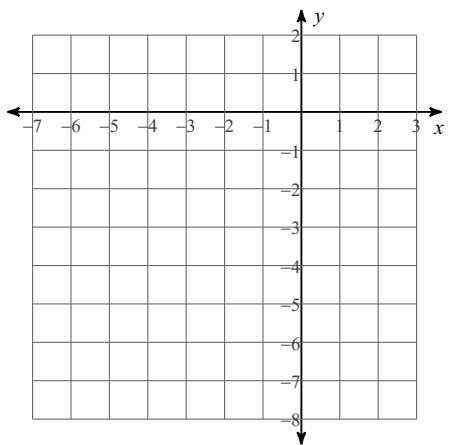
143) $y = -(x - 3)^2 + 1$



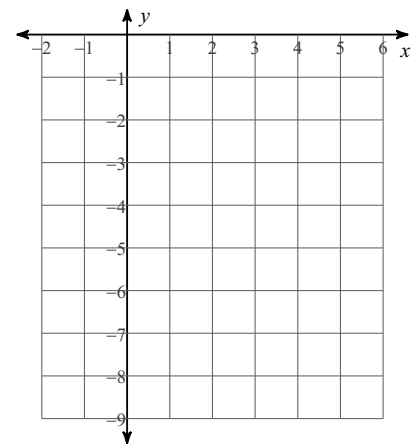
144) $y = -(x + 2)^2 - 1$



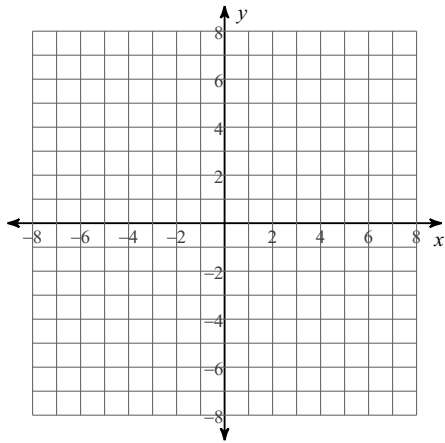
145) $y = -2(x + 2)^2 + 1$



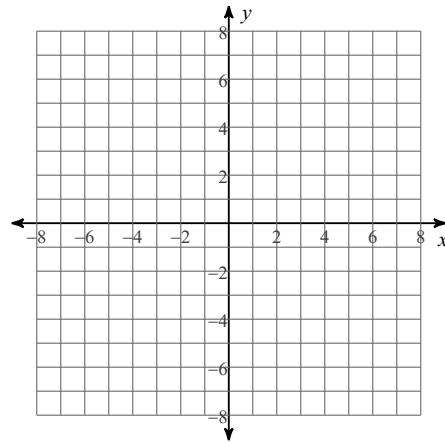
146) $y = -(x - 2)^2 - 4$



$$147) f(x) = x^3 - 4x^2 + 6$$



$$148) f(x) = -x^3 + 3x^2 + 2$$



Find each product.

$$149) (3a + 4)(5a - 2)$$

$$150) (3r - 2)(5r + 5)$$

$$151) (2x - 5)(2x + 5)$$

$$152) (3a + 3)(3a - 3)$$

Solve each equation. Remember to check for extraneous solutions.

$$153) \frac{2}{r} + 4 = \frac{5}{2}$$

$$154) \frac{5m + 30}{m} - \frac{1}{m} = 3$$

$$155) \frac{1}{n} = \frac{1}{6n} - \frac{1}{6}$$

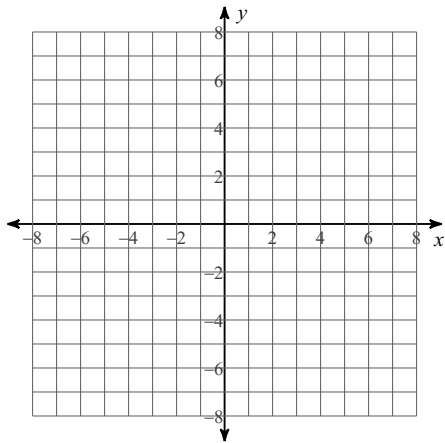
$$156) \frac{1}{x} = \frac{5x + 5}{4x} - \frac{3}{2x^2}$$

$$157) \frac{p-1}{6p^2} - \frac{p+2}{6p^2} = \frac{p-4}{6p}$$

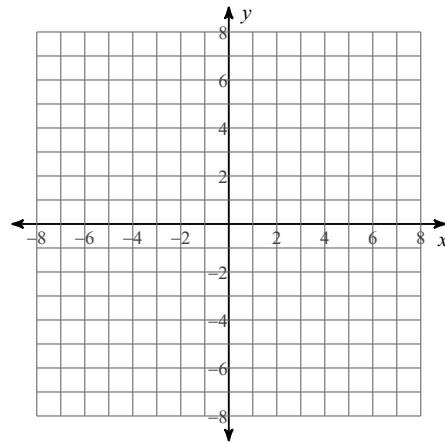
$$158) \frac{x+1}{6} = \frac{x-4}{6} + \frac{x+4}{6x}$$

Graph each function.

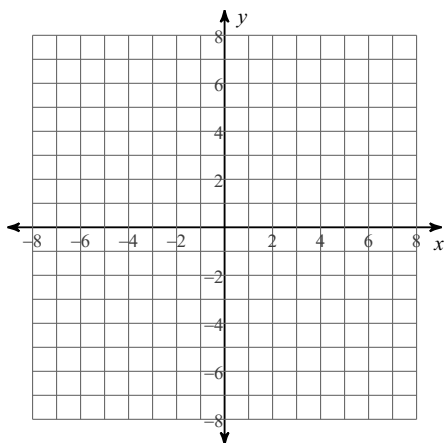
159) $f(x) = \frac{4}{x+2} + 2$



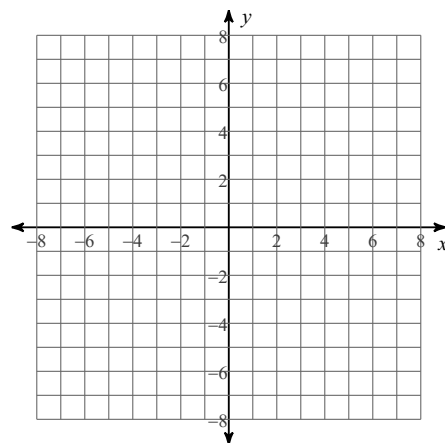
160) $f(x) = -\frac{4}{x+2} - 1$



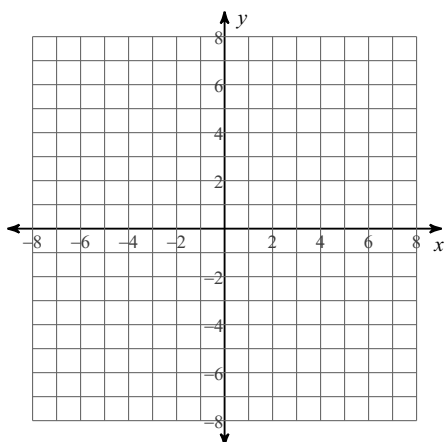
161) $f(x) = -\frac{1}{x-4} - 3$



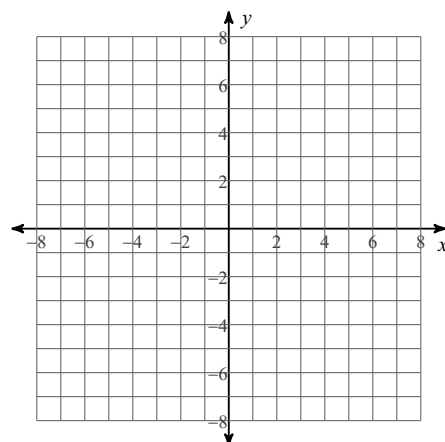
162) $f(x) = -\frac{2}{x+3}$



163) $f(x) = \frac{1}{x-4} + 3$



164) $f(x) = \frac{4}{x-1} - 2$



Simplify each expression.

$$165) \frac{-k^2 + 6k - 5}{k - 5} \cdot \frac{1}{7k + 28}$$

$$166) \frac{10n + 50}{n - 7} \cdot \frac{1}{n + 5}$$

$$167) \frac{21x^2 + 30x}{3x} \cdot \frac{4}{14x + 20}$$

Simplify. Your answer should contain only positive exponents with no fractional exponents in the denominator.

$$168) 4u^{\frac{7}{4}} \cdot 3u^{-2}v^{\frac{1}{2}}$$

$$169) x^{-\frac{3}{2}}y^{\frac{4}{3}} \cdot 4xy^{-\frac{3}{2}}$$

$$170) 3x^{\frac{7}{4}}y^{-\frac{1}{2}} \cdot 4x^{\frac{1}{3}}$$

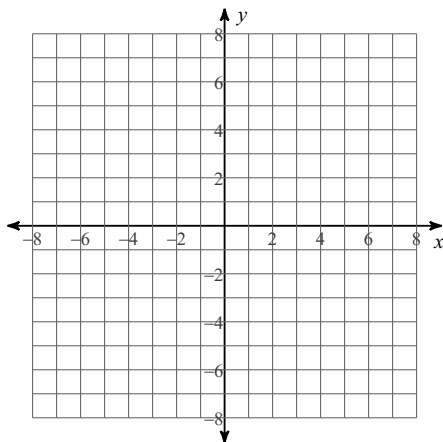
$$171) uv^{\frac{1}{2}} \cdot 4u^{-\frac{5}{3}}v^4$$

$$172) 4x^{\frac{4}{3}} \cdot 3x^{\frac{3}{2}} \cdot 4x^2y^2$$

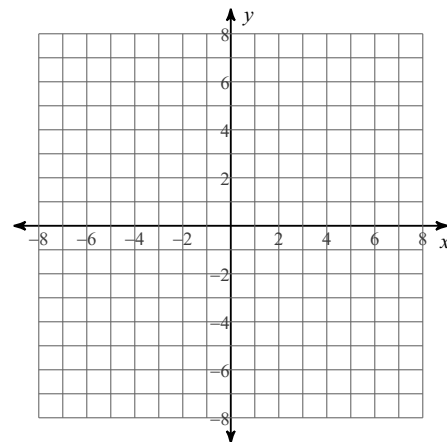
$$173) x^{-\frac{3}{2}} \cdot 4x^{-\frac{5}{4}}y^{-\frac{5}{4}}$$

Sketch the graph of each function.

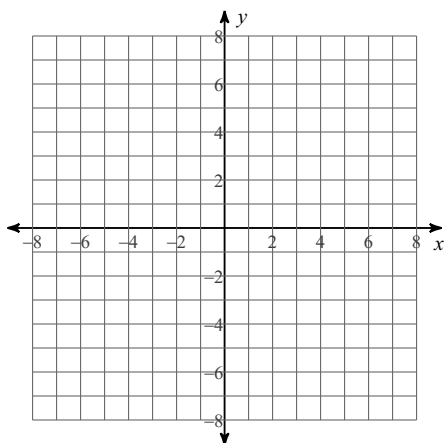
$$174) y = 4\sqrt{x - 3} - 5$$



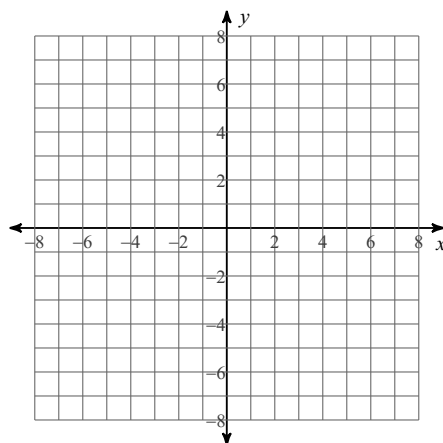
$$175) y = \sqrt{x}$$



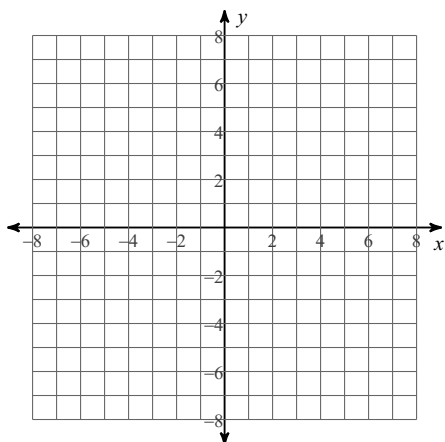
176) $y = \sqrt{x} - 4$



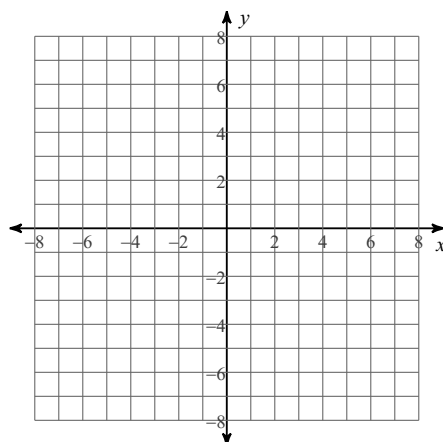
177) $y = \sqrt{x+3} + 1$



178) $y = 2\sqrt{x} - 4$



179) $y = \frac{4}{5}\sqrt{x-4}$



Write each expression in exponential form.

180) $(\sqrt[3]{4x})^5$

181) $(\sqrt[3]{10x})^2$

182) $\sqrt[5]{3n}$

183) $\sqrt{3n}$

184) $\sqrt[4]{2x^2}$

185) $(\sqrt{5r})^5$

Simplify.

186) $\sqrt{252v^4}$

187) $\sqrt{112x}$

188) $\sqrt{32a^3}$

189) $\sqrt{343x^4}$

190) $\sqrt{72k}$

191) $\sqrt{343n^2}$

Solve each equation. Remember to check for extraneous solutions.

192) $5 = \sqrt{\frac{n}{6}}$

193) $\sqrt{4n-1} = \sqrt{3n+1}$

194) $13 = 9 + \sqrt{v-7}$

195) $\sqrt{x-4} = 4$

196) $8 = \sqrt{m+1}$

197) $10 = \sqrt{x+2}$

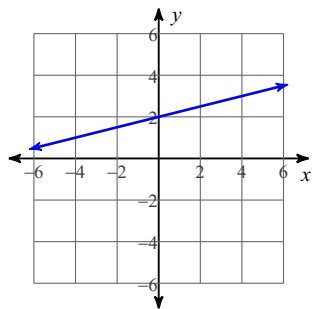
198) $-2 = \sqrt{2x-2} - \sqrt{4x+4}$

199) $\sqrt{2k-16} = k-8$

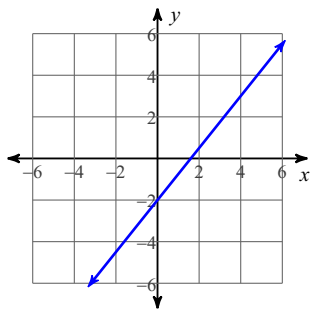
200) $n = \sqrt{4n-15} + 3$

Answers to Summer Work (ID: 1)

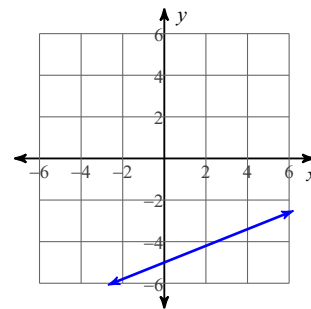
1)



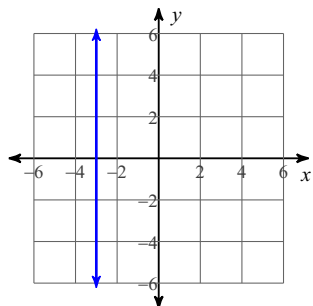
2)



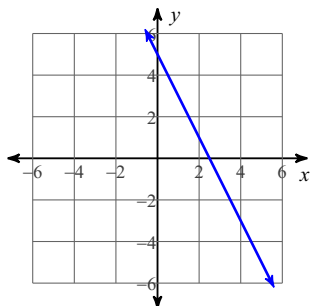
3)



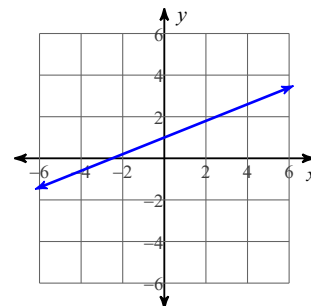
4)



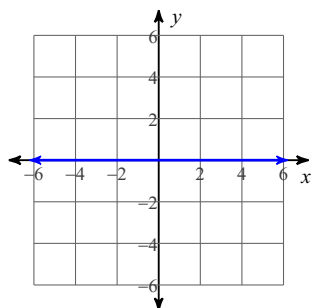
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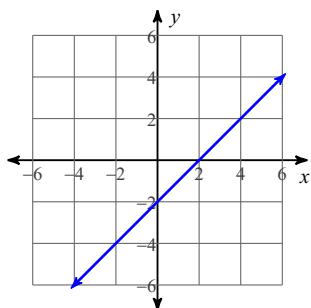
6)



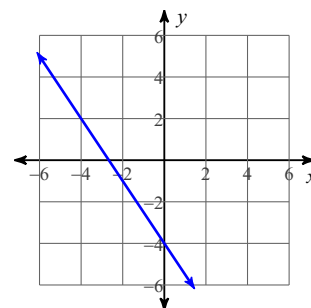
7)



8)



9)



10) $y = -\frac{1}{2}x + 2$

11) $y = -\frac{9}{2}x + 5$

12) $y = 4x + 1$

13) $y = \frac{4}{5}x + 3$

14) $y = 2x - 5$

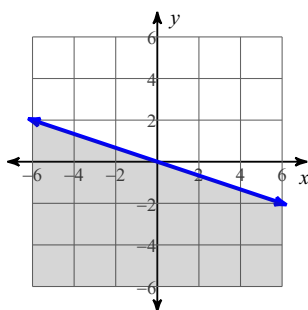
15) $y = -\frac{2}{7}x + \frac{22}{7}$

16) $9x + 2y = 10$

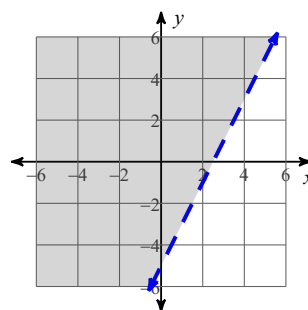
17) $5x + 4y = -25$

18) $5x + 2y = 16$

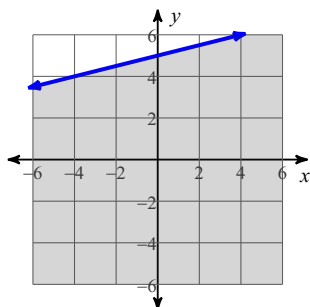
19)



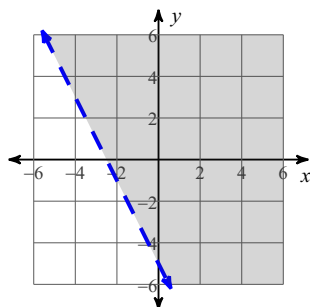
20)



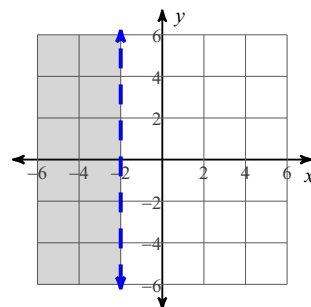
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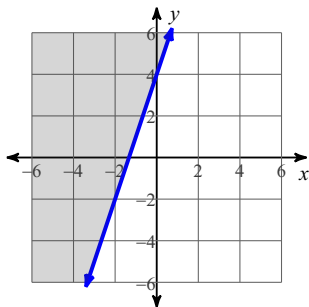
22)



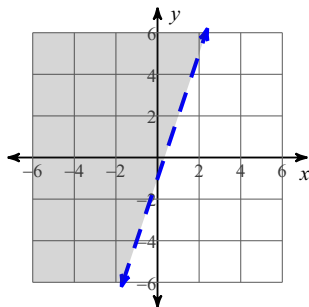
23)



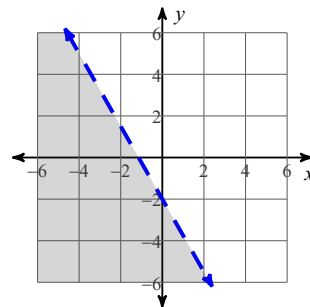
24)



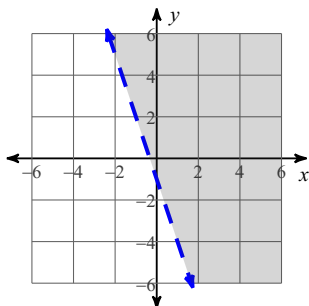
25)



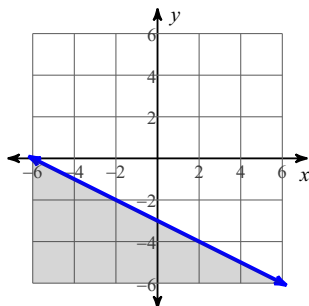
26)



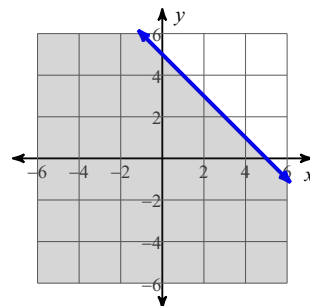
27)



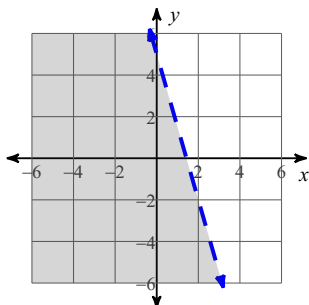
28)



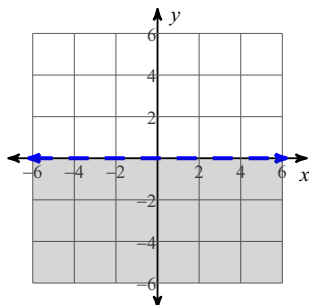
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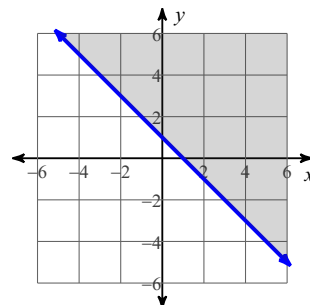
30)



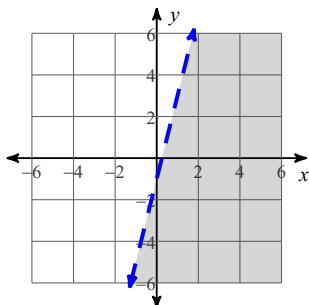
31)



32)



33)

34) $(-3, -1)$ 35) $(-8, 0)$

36) $(x^2 + 5)(8x - 5)$

37) $(7r^2 - 2)(3r - 1)$

38) $(8r^2 - 5)(3r - 8)$

39) $(3u - 1)(3v - 8)$

40) $(u - 3)(2v + 7)$

41) $2(x - 4y^2)(2y + 3x)$

42) $4(4n^2 + 3)(3n + 1)$

43) $4(2a^2 + 1)(a - 4)$

44) $2(5x^2 + 3)(x - 2)$

45) $(x - 1)(x^2 + x + 1)(x + 2)(x^2 - 2x + 4) = 0$

46) $(x^2 - 2)(x^2 + 2)(x - 2)(x + 2)(x^2 + 4) = 0$

47) $(x^2 - 2)(x^2 + 2)(x - 1)(x + 1)(x^2 + 1) = 0$

48) $(x - 1)^2 \cdot (x + 1)^2 \cdot (x^2 + 1)^2 = 0$

49) $x^2(x + 1)(x^2 - x + 1)(x - 5)(x^2 + 5x + 25) = 0$

50) $(x - 1)(x^2 + x + 1)(x + 1)(x^2 - x + 1) = 0$

51) $(x - 3)(x^2 + 3x + 9)(2x - 1)(4x^2 + 2x + 1) = 0$

52) $(x^2 + 5)(2x^2 - 5)(2x^2 + 5) = 0$

53) $(5x^2 - 2)(x^2 - 3)(x^2 + 3) = 0$

54) $x(3x - 2)(9x^2 + 6x + 4)(x + 2)(x^2 - 2x + 4) = 0$

55) $(3x - 1)(9x^2 + 3x + 1)(x + 2)(x^2 - 2x + 4) = 0$

56) $(x^2 - 3)(x^2 + 3)(3x^2 - 4)(3x^2 + 4) = 0$

57) $(5x - 2)(5x^2 + 3) = 0$

58) $(2x^2 - 1)(2x^2 + 1)(4x^2 - 3)(4x^2 + 3) = 0$

59) $(3x^2 - 1)(2x^2 - 9) = 0$

60) $(3x^2 - 4)(5x^2 - 7) = 0$

61) $(5x^2 - 1)(5x^2 + 1)(3x^2 - 2)(3x^2 + 2) = 0$

62) $(3x^2 - 2)(3x^2 + 2)(5x^2 - 3)(5x^2 + 3) = 0$

63) $(x^2 - 2)(2x^2 - 3)(2x^2 + 3) = 0$

64) $(2x - 1)(2x + 1)(4x^2 + 1)(x - 2)(x + 2)(x^2 + 4) = 0$

65) $(x - 1)(x^2 + x + 1)(3x + 5)(9x^2 - 15x + 25) = 0$

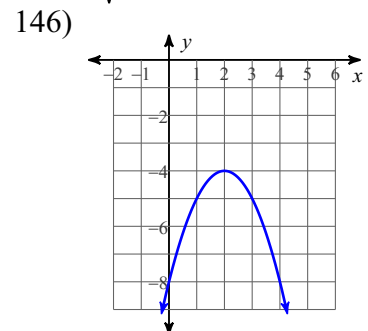
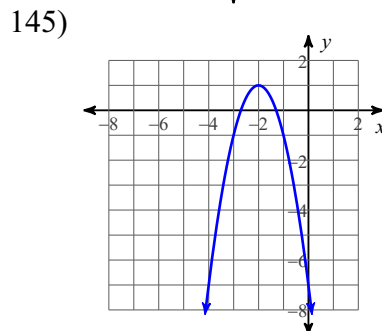
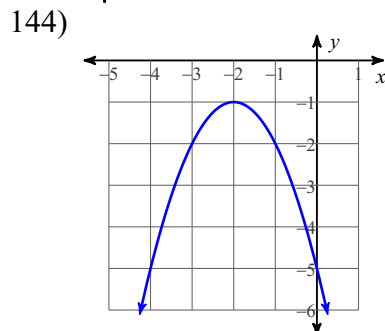
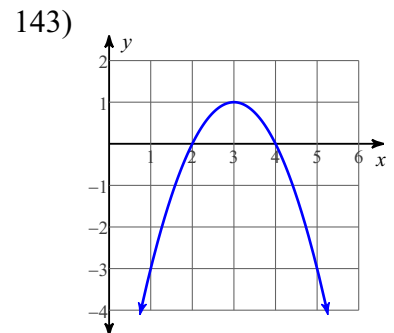
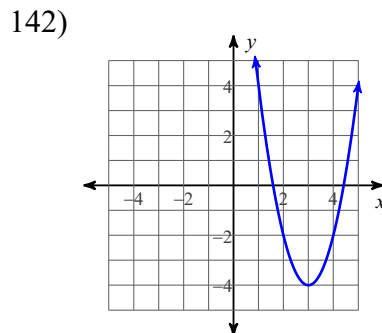
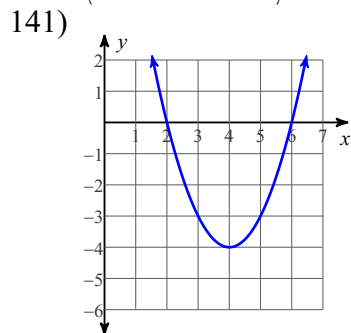
66) $(5x - 4)(x + 2) = 0$

67) $(3x^2 - 8)(x^2 + 1) = 0$

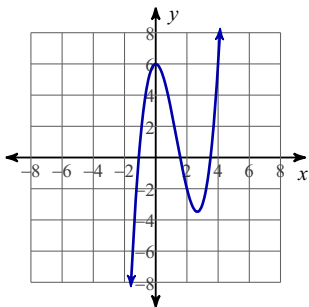
- 68) $(x-2)(x^2+2x+4)(x+2)(x^2-2x+4)=0$ 69) $(x+4)(x-5)=0$ 70) $(x+5)(x^2-5)=0$
 71) $(x+5)(x^2+1)=0$ 72) $(x-4)(x^2+2)=0$ 73) $x^2(x+1)(x+3)=0$
 74) $(x-2)(x^2+2x+4)(x+2)(x^2-2x+4)=0$ 75) $(m+4)(m-4)$ 76) $(k+4)^2$
 77) $(b+3)(b-3)$ 78) $(m^2+1)^2$ 79) $(x^2+3)^2$ 80) $(x^2+3)(x^2-3)$
 81) $(x^3+2)(x^3-2)$ 82) $(k^3+5)(k^3-5)$ 83) $(x^3+3)^2$ 84) $6(x^3-5)(x^3+9)$
 85) $(x^3-9)(x^3+4)$ 86) $4(x^3+5)(x^3+6)$ 87) $-(2x^3-3)(x^3+7)$ 88) $4(7a^4+3)(a^4-7)$
 89) $4(3x^3-5)(x^3-4)$ 90) $6(5x^3+3)(5x^3+6)$ 91) $5(4x^3-3)(2x^3+5)$
 92) $(4a^3-7)(4a^3-5)$ 93) $\{-1, 0\}$ 94) $\{2, 4\}$ 95) $\{-3, 0\}$
 96) $\{3, 2\}$ 97) $\{-2, 0\}$ 98) $\{8, -5\}$ 99) $\{-2, 0\}$
 100) $\{-1, 1\}$ 101) $\{-7, -8\}$ 102) $\{7, -4\}$ 103) $\{-8, -2\}$
 104) $\{2, 7\}$ 105) $\left\{-\frac{1}{2}, \frac{7}{5}\right\}$ 106) $\left\{-\frac{5}{3}, -4\right\}$ 107) $\left\{-\frac{8}{5}, 4\right\}$
 108) $\left\{\frac{4}{5}, -7\right\}$ 109) $\left\{\frac{3}{5}, 5\right\}$ 110) $\left\{-\frac{4}{7}, \frac{5}{2}\right\}$

- 111) -159 ; two imaginary solutions 112) 0 ; one real solution
 113) 25 ; two real solutions 114) 0 ; one real solution 115) 0 ; one real solution
 116) -24 ; two imaginary solutions 117) $\{7, -13\}$ 118) $\{5, -11\}$
 119) $\{11, -3\}$ 120) $\{10+7\sqrt{3}, 10-7\sqrt{3}\}$ 121) $\{22, -2\}$
 122) $\{5, -19\}$ 123) $\{-5, 0\}$ 124) $\{1, 5\}$ 125) $\{-8, 2\}$
 126) $\{5, -2\}$ 127) $\{-2, 0\}$ 128) $\{-3, 6\}$

- 129) $\left\{\frac{i\sqrt{742}}{7}, -\frac{i\sqrt{742}}{7}\right\}$ 130) $\left\{\frac{1}{2}, -\frac{1}{2}\right\}$ 131) $\{2, -2\}$
 132) $\{\sqrt{13}, -\sqrt{13}\}$ 133) $\{10, -10\}$ 134) $\{2\sqrt{11}, -2\sqrt{11}\}$
 135) $\left\{\frac{2+\sqrt{22}}{3}, \frac{2-\sqrt{22}}{3}\right\}$ 136) $\left\{\frac{-9+\sqrt{465}}{24}, \frac{-9-\sqrt{465}}{24}\right\}$ 137) $\left\{\frac{i\sqrt{35}}{7}, -\frac{i\sqrt{35}}{7}\right\}$
 138) $\left\{\frac{2\sqrt{6}}{3}, -\frac{2\sqrt{6}}{3}\right\}$ 139) $\{\sqrt{10}, -\sqrt{10}\}$ 140) $\left\{8, -\frac{17}{2}\right\}$



147)



150) $15r^2 + 5r - 10$

151) $4x^2 - 25$

152) $9a^2 - 9$

153) $\left\{-\frac{4}{3}\right\}$

154) $\left\{-\frac{29}{2}\right\}$

155) $\{-5\}$

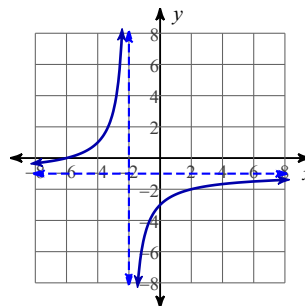
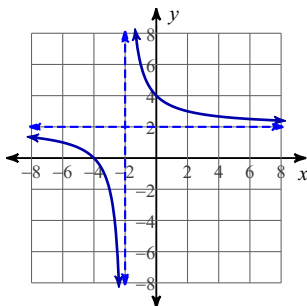
156) $\left\{1, -\frac{6}{5}\right\}$

157) $\{3, 1\}$

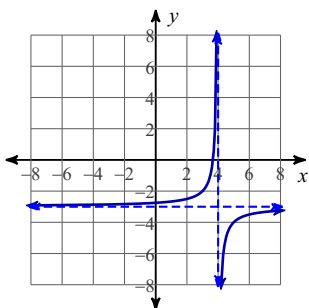
158) $\{1\}$

159)

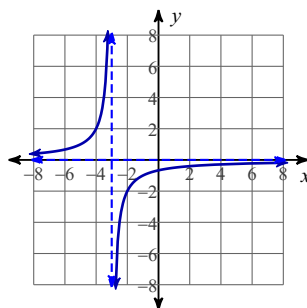
160)



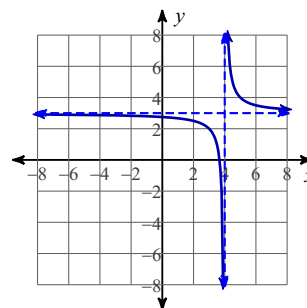
161)



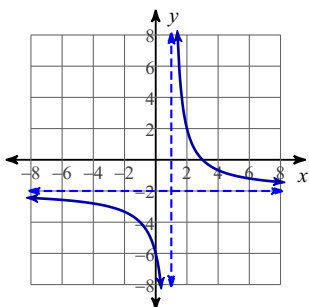
162)



163)



164)



165) $\frac{-k+1}{7(k+4)}$

166) $\frac{10}{n-7}$

167) 2

168) $\frac{12u^{\frac{3}{4}}v^{\frac{1}{2}}}{u}$

169) $\frac{4y^{\frac{5}{6}}x^{\frac{1}{2}}}{yx}$

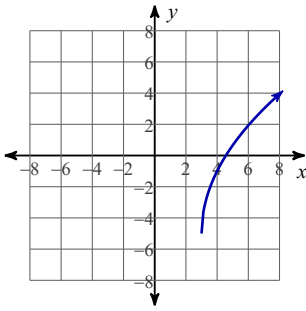
170) $\frac{12y^{\frac{1}{2}}x^{\frac{25}{12}}}{y}$

171) $\frac{4u^{\frac{1}{3}}v^{\frac{9}{2}}}{u}$

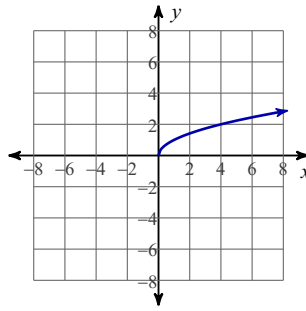
172) $48y^2x^{\frac{29}{6}}$

173) $\frac{4x^{\frac{1}{4}}y^{\frac{3}{4}}}{x^3y^2}$

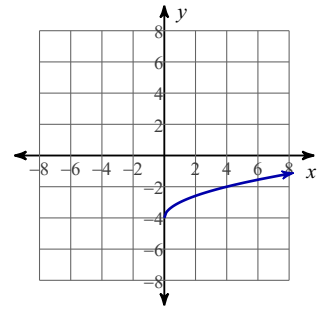
174)



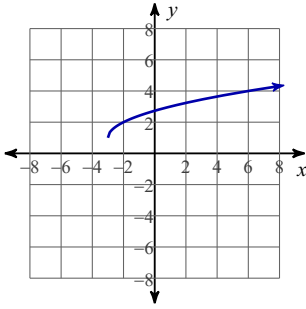
175)



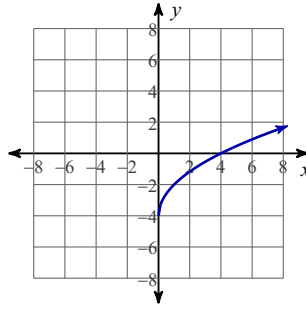
176)



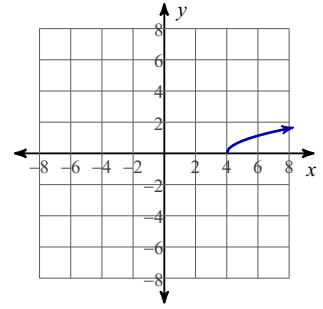
177)



178)



179)



180) $(4x)^{\frac{5}{3}}$

181) $(10x)^{\frac{2}{3}}$

182) $(3n)^{\frac{1}{5}}$

183) $(3n)^{\frac{1}{2}}$

184) $(2x^2)^{\frac{1}{4}}$

185) $(5r)^{\frac{5}{2}}$

186) $6v^2\sqrt{7}$

187) $4\sqrt{7x}$

188) $4a\sqrt{2a}$

189) $7x^2\sqrt{7}$

190) $6\sqrt{2k}$

191) $7n\sqrt{7}$

192) $\{150\}$

193) $\{2\}$

194) $\{23\}$

195) $\{20\}$

196) $\{63\}$

197) $\{98\}$

198) $\{3\}$

199) $\{8, 10\}$

200) $\{6, 4\}$

Summer work2

Date _____ Period _____

Describe the transformations necessary to transform the graph of $f(x)$ into that of $g(x)$.

$$1) \begin{aligned} f(x) &= x^3 \\ g(x) &= -(x+2)^3 \end{aligned}$$

$$2) \begin{aligned} f(x) &= x^2 \\ g(x) &= -(x-3)^2 \end{aligned}$$

$$3) \begin{aligned} f(x) &= x^3 \\ g(x) &= \left(\frac{1}{2}x\right)^3 - 2 \end{aligned}$$

$$4) \begin{aligned} f(x) &= \sqrt{x} \\ g(x) &= \sqrt{2(x-2)} + 3 \end{aligned}$$

$$5) \begin{aligned} f(x) &= |x| \\ g(x) &= -2|x| \end{aligned}$$

$$6) \begin{aligned} f(x) &= x^2 \\ g(x) &= -(x-3)^2 \end{aligned}$$

$$7) \begin{aligned} f(x) &= \sqrt{x} \\ g(x) &= \sqrt{2(x+2)} - 1 \end{aligned}$$

$$8) \begin{aligned} f(x) &= \frac{1}{x} \\ g(x) &= -\frac{1}{x} + 1 \end{aligned}$$

$$9) \begin{aligned} f(x) &= x^3 \\ g(x) &= -(3x)^3 \end{aligned}$$

$$10) \begin{aligned} f(x) &= \frac{1}{x} \\ g(x) &= \frac{1}{x-3} + 3 \end{aligned}$$

Transform the given function $f(x)$ as described and write the resulting function as an equation.

$$11) \begin{aligned} f(x) &= |x| \\ &\text{compress vertically by a factor of 3} \\ &\text{reflect across the x-axis} \\ &\text{translate right 3 units} \\ &\text{translate down 3 units} \end{aligned}$$

$$12) \begin{aligned} f(x) &= \frac{1}{x} \\ &\text{expand vertically by a factor of 2} \\ &\text{reflect across the x-axis} \\ &\text{translate right 2 units} \\ &\text{translate up 1 unit} \end{aligned}$$

13) $f(x) = \frac{1}{x}$

expand vertically by a factor of 3
 reflect across the x-axis
 translate right 3 units
 translate up 1 unit

14) $f(x) = |x|$

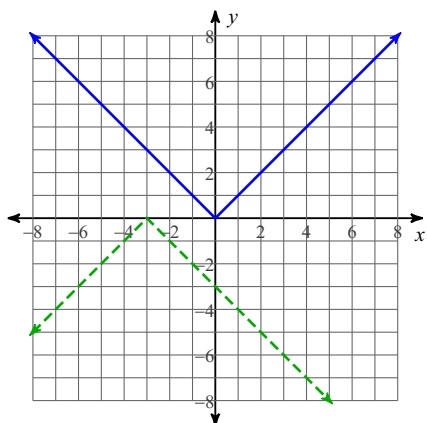
compress vertically by a factor of 2
 reflect across the x-axis
 translate left 2 units
 translate up 2 units

15) $f(x) = \frac{1}{x}$

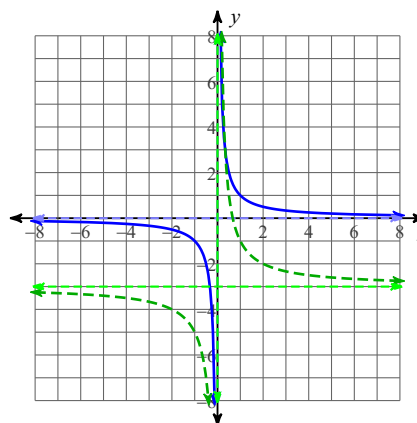
expand vertically by a factor of 2
 reflect across the x-axis
 translate left 3 units
 translate up 3 units

Describe the transformations necessary to transform the graph of $f(x)$ (solid line) into that of $g(x)$ (dashed line).

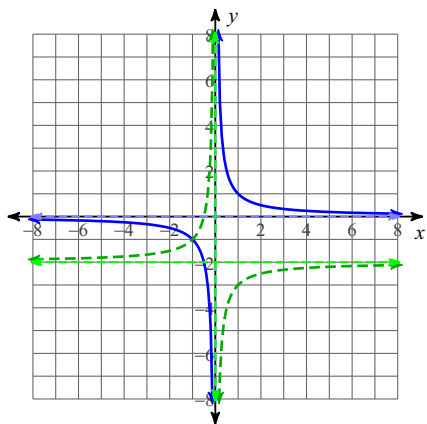
16)



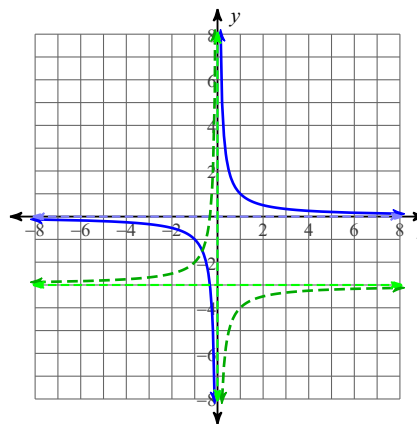
17)



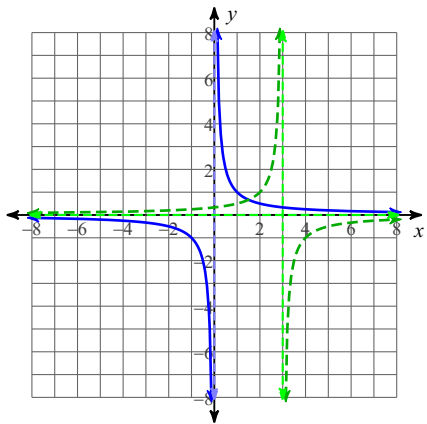
18)



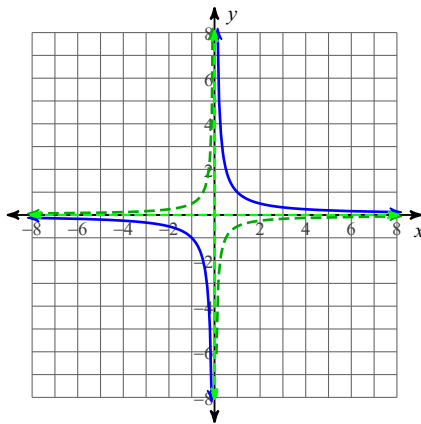
19)



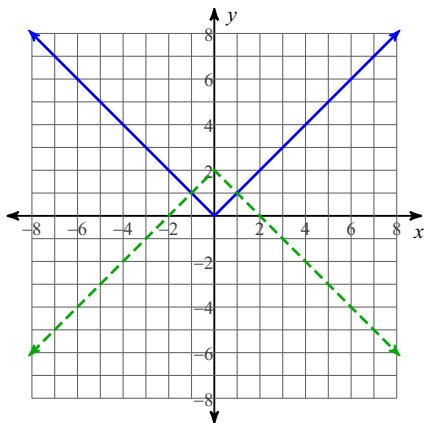
20)



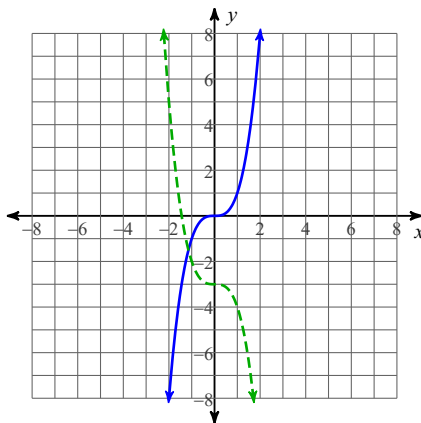
21)



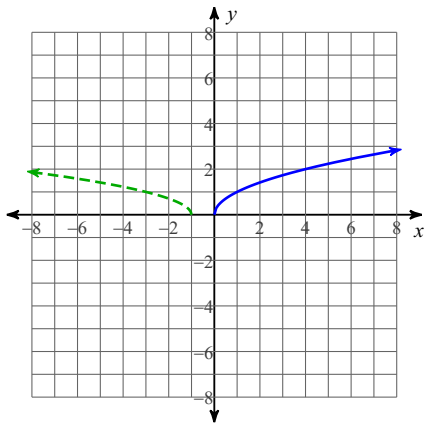
22)



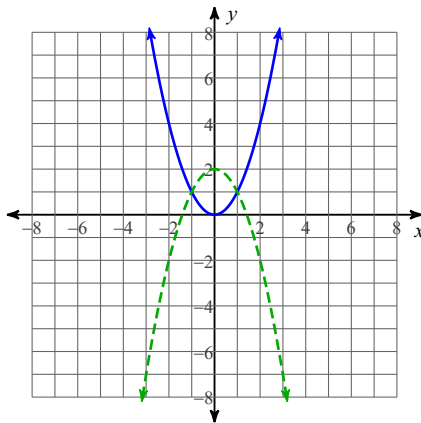
23)



24)

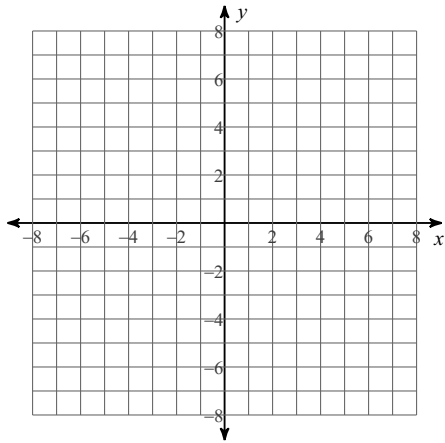


25)

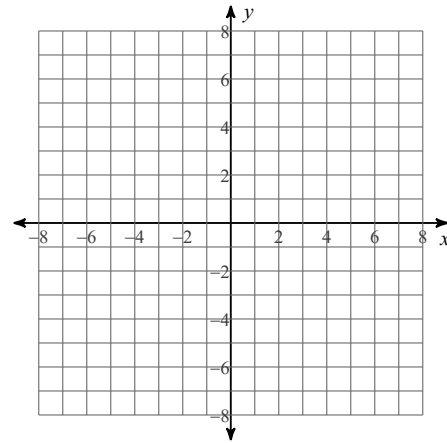


For each function: (1) state the maximum number of turns the graph could make, (2) determine the real zeros and state the multiplicity of any repeated zeros, (3) list the x-intercepts where the graph crosses the x-axis and those where it does not cross the x-axis, (4) describe the end behavior, and (5) sketch the graph.

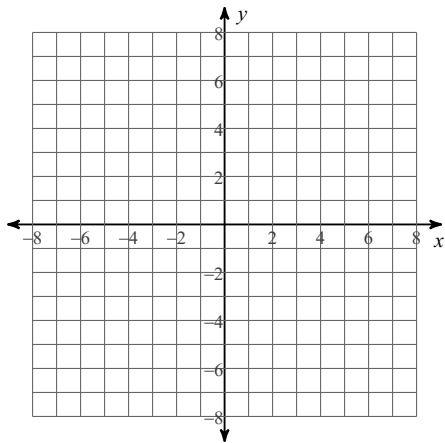
26) $f(x) = 2x^2 + 5x$



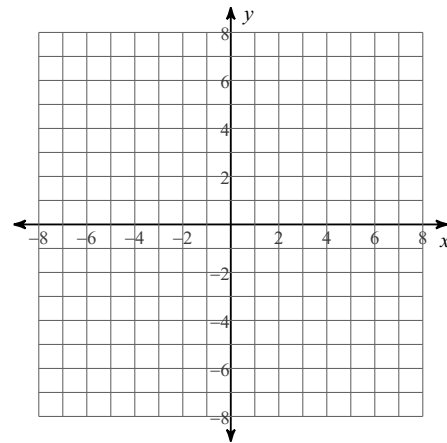
27) $f(x) = x^2 + 5x$



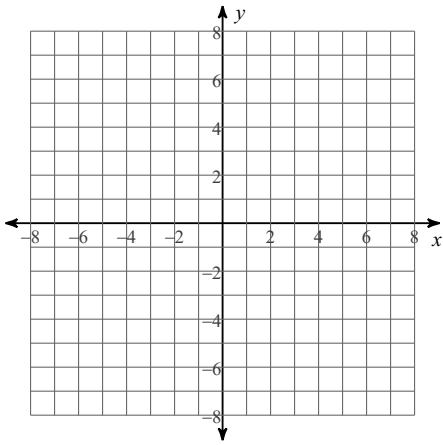
28) $f(x) = -x^2 + 2x$



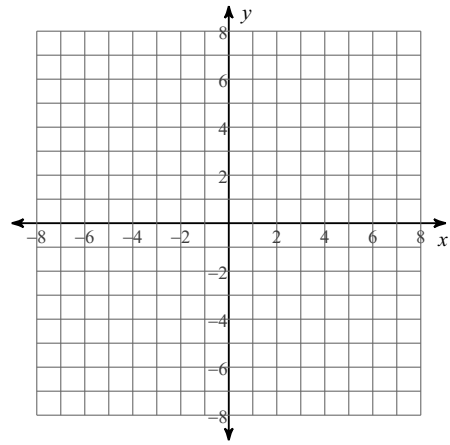
29) $f(x) = 4x^2 - 12x + 9$



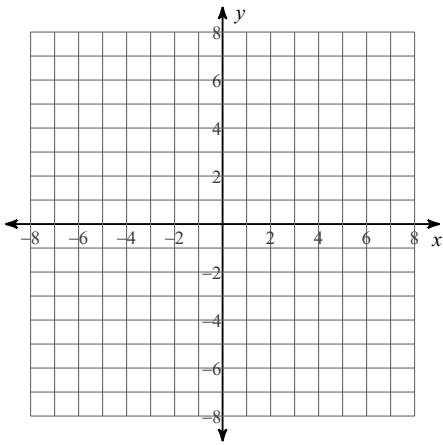
30) $f(x) = -x^2$



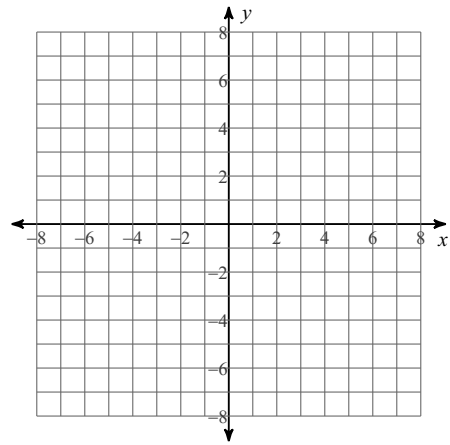
31) $f(x) = x^2 + 5x + 6$



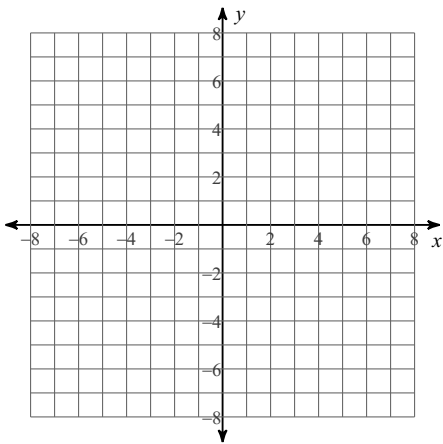
32) $f(x) = x^2$



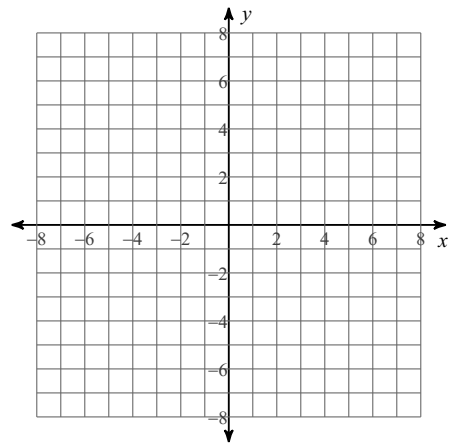
33) $f(x) = x^2 - 4x + 4$



34) $f(x) = -x^2 - 3x$



35) $f(x) = x^2 + 2x + 1$



Answers to Summer work2 (ID: 1)

- 1) reflect across the x-axis
translate left 2 units
- 2) reflect across the x-axis
translate right 3 units
- 3) expand horizontally by a factor of 2
translate down 2 units
- 4) compress horizontally by a factor of 2
translate right 2 units
translate up 3 units
- 5) expand vertically by a factor of 2
reflect across the x-axis
- 6) reflect across the x-axis
translate right 3 units
- 7) compress horizontally by a factor of 2
translate left 2 units
translate down 1 unit
- 8) reflect across the x-axis
translate up 1 unit
- 9) compress horizontally by a factor of 3
reflect across the x-axis
- 10) translate right 3 units
translate up 3 units

11) $g(x) = -\frac{1}{3} \cdot |x - 3| - 3$

12) $g(x) = -\frac{2}{x - 2} + 1$

13) $g(x) = -\frac{3}{x - 3} + 1$

14) $g(x) = -\frac{1}{2} \cdot |x + 2| + 2$

15) $g(x) = -\frac{2}{x + 3} + 3$

16) reflect across the x-axis
translate left 3 units

17) expand vertically by a factor of 2
translate down 3 units

18) reflect across the x-axis
translate down 2 units

19) reflect across the x-axis
translate down 3 units

20) reflect across the x-axis
translate right 3 units

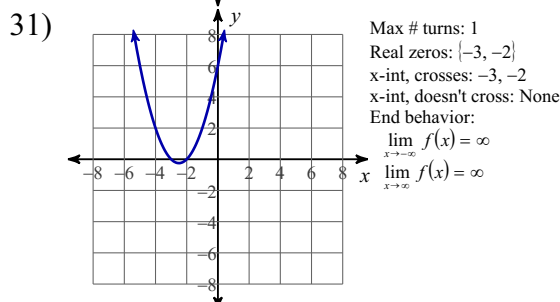
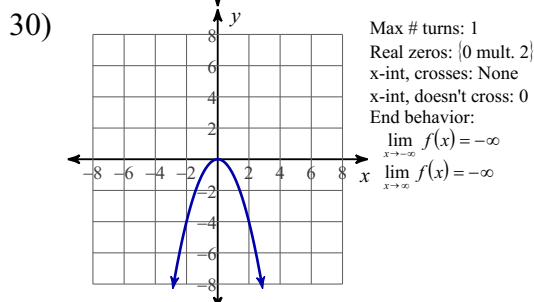
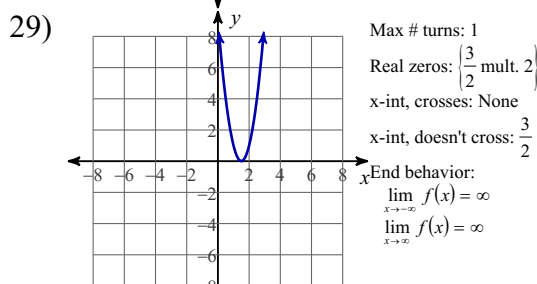
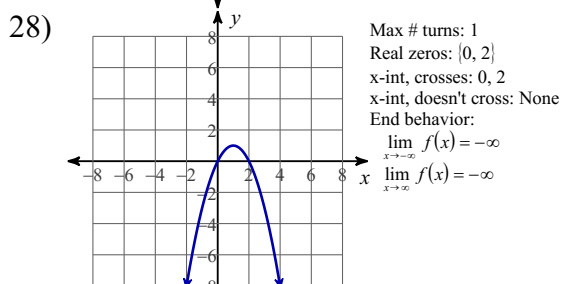
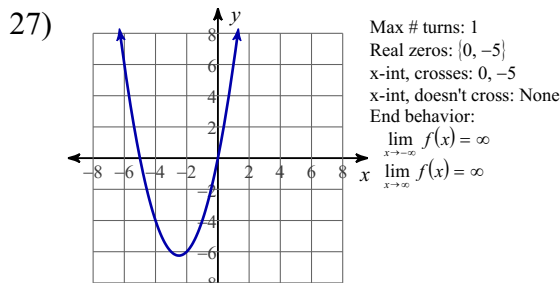
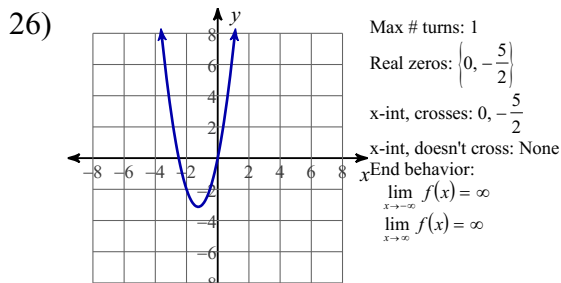
21) compress horizontally by a factor of 2
reflect across the x-axis

22) reflect across the x-axis
translate up 2 units

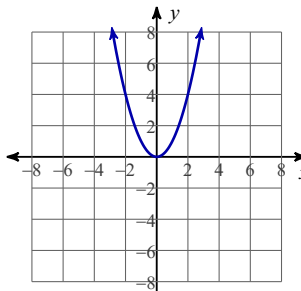
23) reflect across the x-axis
translate down 3 units

24) expand horizontally by a factor of 2
reflect across the y-axis
translate left 1 unit

25) reflect across the x-axis
translate up 2 units

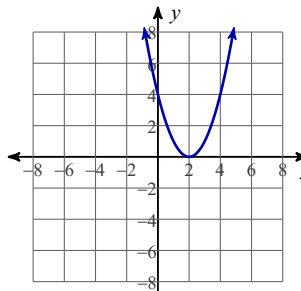


32)



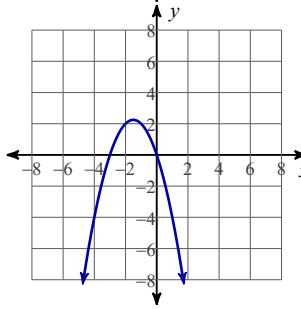
Max # turns: 1
 Real zeros: {0 mult. 2}
 x-int, crosses: None
 x-int, doesn't cross: 0
 End behavior:
 $\lim_{x \rightarrow -\infty} f(x) = \infty$
 $\lim_{x \rightarrow \infty} f(x) = \infty$

33)



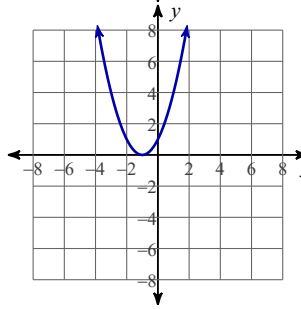
Max # turns: 1
 Real zeros: {2 mult. 2}
 x-int, crosses: None
 x-int, doesn't cross: 2
 End behavior:
 $\lim_{x \rightarrow -\infty} f(x) = \infty$
 $\lim_{x \rightarrow \infty} f(x) = \infty$

34)



Max # turns: 1
 Real zeros: {0, -3}
 x-int, crosses: 0, -3
 x-int, doesn't cross: None
 End behavior:
 $\lim_{x \rightarrow -\infty} f(x) = -\infty$
 $\lim_{x \rightarrow \infty} f(x) = -\infty$

35)



Max # turns: 1
 Real zeros: {-1 mult. 2}
 x-int, crosses: None
 x-int, doesn't cross: -1
 End behavior:
 $\lim_{x \rightarrow -\infty} f(x) = \infty$
 $\lim_{x \rightarrow \infty} f(x) = \infty$

SL 1 IB Questions Summer work

[50 marks]

1a. A metal sphere has a radius 12.7 cm.

[3 marks]

Find the volume of the sphere expressing your answer in the form $a \times 10^k$, $1 \leq a < 10$ and $k \in \mathbb{Z}$.

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1b. The sphere is to be melted down and remoulded into the shape of a cone with a height of 14.8 cm.

[3 marks]

Find the radius of the base of the cone, correct to 2 significant figures.

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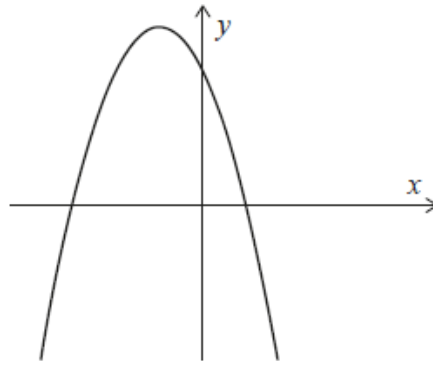
2. Solve the equation $2 \ln x = \ln 9 + 4$. Give your answer in the form $x = pe^q$ where $p, q \in \mathbb{Z}^+$.

[5 marks]

A large rectangular box with a solid black border, containing 15 horizontal dotted lines for writing the solution.

3a. Consider the function $f(x) = -2(x - 1)(x + 3)$, for $x \in \mathbb{R}$. The following diagram shows part of the graph of f .

[2 marks]



For the graph of f

find the x -coordinates of the x -intercepts.

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3b. find the coordinates of the vertex.

[3 marks]

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3c. The function f can be written in the form $f(x) = -2(x - h)^2 + k$.

[2 marks]

Write down the value of h and the value of k .

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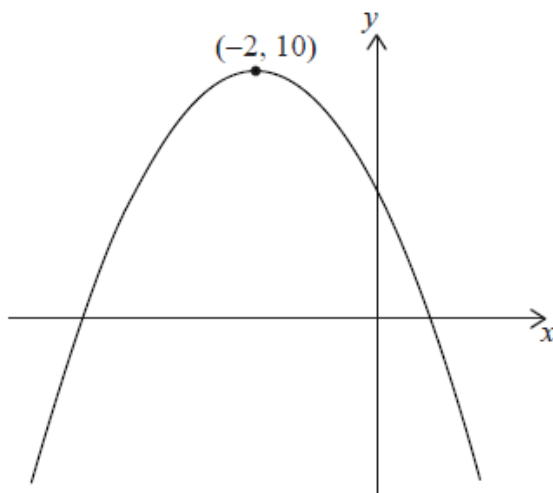
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5. The diagram shows the graph of the quadratic function $f(x) = ax^2 + bx + c$, with vertex $(-2, 10)$.

[2 marks]



The equation $f(x) = k$ has two solutions. One of these solutions is $x = 2$.

Write down the other solution of $f(x) = k$.

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6b. A second truck arrives whose ladder, when fully extended, is 30 metres long. The base of this ladder is also 4 metres above the ground. For safety reasons, the maximum angle of elevation that the ladder can make is 70° .

Find the maximum height on the wall that can be reached by the ladder on the second truck.

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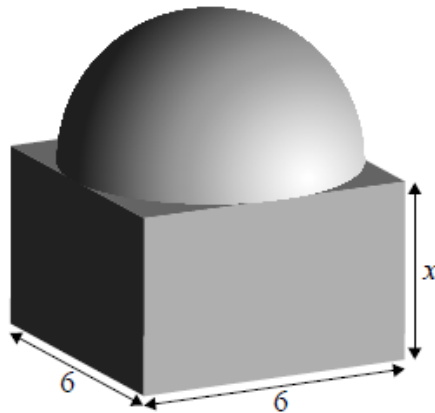
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7a. A solid glass paperweight consists of a hemisphere of diameter 6 cm on top of a cuboid with a square base of length 6 cm, as shown [1 mark] in the diagram.

diagram not to scale



The height of the cuboid, x cm, is equal to the height of the hemisphere.

Write down the value of x .

.....

7b. Calculate the volume of the paperweight.

[3 marks]

7c. 1 cm^3 of glass has a mass of 2.56 grams.

[2 marks]

Calculate the mass, in grams, of the paperweight.

8. Find the size of the angle of depression of B from P.

[2 marks]

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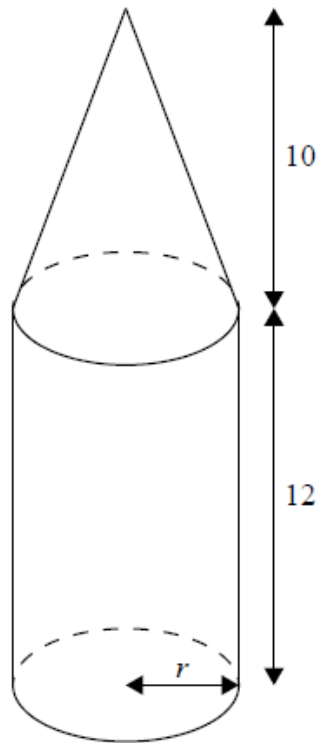
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9. Julio is making a wooden pencil case in the shape of a large pencil. The pencil case consists of a cylinder attached to a cone, as shown. [2 marks]

The cylinder has a radius of r cm and a height of 12 cm.

The cone has a base radius of r cm and a height of 10 cm.

diagram not to scale



Find an expression for the slant height of the cone **in terms of r** .

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SL 1 IB Questions Summer work

[50 marks]

A metal sphere has a radius 12.7 cm.

- 1a. Find the volume of the sphere expressing your answer in the form $a \times 10^k$, $1 \leq a < 10$ and $k \in \mathbb{Z}$. [3 marks]

Markscheme

$$\frac{4}{3}\pi(12.7)^3 \text{ (or equivalent)} \quad \mathbf{A1}$$

$$8580.24 \quad \mathbf{(A1)}$$

$$V = 8.58 \times 10^3 \quad \mathbf{A1}$$

[3 marks]

- 1b. The sphere is to be melted down and remoulded into the shape of a cone with a height of 14.8 cm. [3 marks]

Find the radius of the base of the cone, correct to 2 significant figures.

Markscheme

recognising volume of the cone is same as volume of **their** sphere (M1)

$$\frac{1}{3}\pi r^2 (14.8) = 8580.24 \text{ (or equivalent)} \quad \mathbf{A1}$$

$$r = 23.529$$

$$r = 24 \text{ (cm) correct to 2 significant figures} \quad \mathbf{A1}$$

[3 marks]

2. Solve the equation $2 \ln x = \ln 9 + 4$. Give your answer in the form $x = pe^q$ where $p, q \in \mathbb{Z}^+$. [5 marks]

Markscheme

* This sample question was produced by experienced DP mathematics senior examiners to aid teachers in preparing for external assessment in the new MAA course. There may be minor differences in formatting compared to formal exam papers.

METHOD 1

$$2 \ln x - \ln 9 = 4$$

uses $m \ln x = \ln x^m$ (M1)

$$\ln x^2 - \ln 9 = 4$$

uses $\ln a - \ln b = \ln \frac{a}{b}$ (M1)

$$\ln \frac{x^2}{9} = 4$$

$$\frac{x^2}{9} = e^4 \text{ A1}$$

$$x^2 = 9e^4 \Rightarrow x = \sqrt{9e^4} (x > 0) \text{ A1}$$

$$x = 3e^2 (p = 3, q = 2) \text{ A1}$$

METHOD 2

expresses 4 as $4 \ln e$ and uses $\ln x^m = m \ln x$ (M1)

$$2 \ln x = 2 \ln 3 + 4 \ln e (\ln x = \ln 3 + 2 \ln e) \text{ A1}$$

uses $2 \ln e = \ln e^2$ and $\ln a + \ln b = \ln ab$ (M1)

$$\ln x = \ln (3e^2) \text{ A1}$$

$$x = 3e^2 (p = 3, q = 2) \text{ A1}$$

METHOD 3

expresses 4 as $4 \ln e$ and uses $m \ln x = \ln x^m$ (M1)

$$\ln x^2 = \ln 3^2 + \ln e^4 \text{ A1}$$

uses $\ln a + \ln b = \ln ab$ (M1)

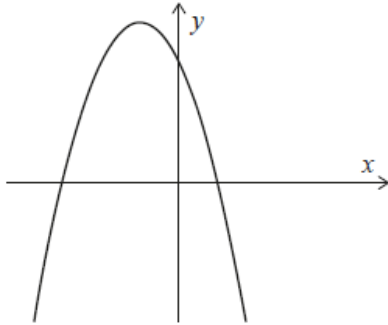
$$\ln x^2 = \ln (3^2 e^4)$$

$$x^2 = 3^2 e^4 \Rightarrow x = \sqrt{3^2 e^4} (x > 0) \text{ A1}$$

$$\text{so } x = 3e^2 (x > 0) (p = 3, q = 2) \text{ A1}$$

[5 marks]

Consider the function $f(x) = -2(x - 1)(x + 3)$, for $x \in \mathbb{R}$. The following diagram shows part of the graph of f .



For the graph of f

3a. find the x -coordinates of the x -intercepts.

[2 marks]

Markscheme

setting $f(x) = 0$ (M1)

$x = 1, x = -3$ (accept $(1, 0), (-3, 0)$) A1

[2 marks]

3b. find the coordinates of the vertex.

[3 marks]

Markscheme

METHOD 1

$$x = -1 \quad \mathbf{A1}$$

substituting their x -coordinate into f **(M1)**

$$y = 8 \quad \mathbf{A1}$$

$$(-1, 8)$$

METHOD 2

attempt to complete the square **(M1)**

$$-2\left((x + 1)^2 - 4\right) \quad \mathbf{(M1)}$$

$$x = -1, y = 8 \quad \mathbf{A1A1}$$

$$(-1, 8)$$

[3 marks]

3c. The function f can be written in the form $f(x) = -2(x - h)^2 + k$. **[2 marks]**

Write down the value of h and the value of k .

Markscheme

$$h = -1 \quad \mathbf{A1}$$

$$k = 8 \quad \mathbf{A1}$$

[2 marks]

Let $f(x) = mx^2 - 2mx$, where $x \in \mathbb{R}$ and $m \in \mathbb{R}$. The line $y = mx - 9$ meets the graph of f at exactly one point.

4a. Show that $m = 4$.

[6 marks]

Markscheme

METHOD 1 (discriminant)

$$mx^2 - 2mx = mx - 9 \text{ (M1)}$$

$$mx^2 - 3mx + 9 = 0$$

recognizing $\Delta = 0$ (seen anywhere) **M1**

$$\Delta = (-3m)^2 - 4(m)(9) \text{ (do not accept only in quadratic formula for } x) \text{ A1}$$

valid approach to solve quadratic for m **(M1)**

$$9m(m - 4) = 0 \text{ OR } m = \frac{36 \pm \sqrt{36^2 - 4 \times 9 \times 0}}{2 \times 9}$$

both solutions $m = 0, 4$ **A1**

$m \neq 0$ with a valid reason **R1**

the two graphs would not intersect OR $0 \neq -9$

$m = 4$ **AG**

METHOD 2 (equating slopes)

$$mx^2 - 2mx = mx - 9 \text{ (seen anywhere) (M1)}$$

$$f'(x) = 2mx - 2m \text{ A1}$$

equating slopes, $f'(x) = m$ (seen anywhere) **M1**

$$2mx - 2m = m$$

$$x = \frac{3}{2} \text{ A1}$$

substituting their x value **(M1)**

$$\left(\frac{3}{2}\right)^2 m - 2m \times \frac{3}{2} = m \times \frac{3}{2} - 9$$

$$\frac{9}{4}m - \frac{12}{4}m = \frac{6}{4}m - 9 \text{ A1}$$

$$\frac{-9m}{4} = -9$$

$m = 4$ **AG**

METHOD 3 (using $\frac{-b}{2a}$)

$$mx^2 - 2mx = mx - 9 \text{ (M1)}$$

$$mx^2 - 3mx + 9 = 0$$

attempt to find x -coord of vertex using $\frac{-b}{2a}$ **(M1)**

$$\frac{-(-3m)}{2m} \text{ A1}$$

$$x = \frac{3}{2} \text{ A1}$$

substituting their x value **(M1)**

$$\left(\frac{3}{2}\right)^2 m - 3m \times \frac{3}{2} + 9 = 0$$

$$\frac{9}{4}m - \frac{9}{2}m + 9 = 0 \text{ **A1**}$$

$$-9m = -36$$

$$m = 4 \text{ **AG**}$$

[6 marks]

The function f can be expressed in the form $f(x) = 4(x - p)(x - q)$, where $p, q \in \mathbb{R}$.

4b. Find the value of p and the value of q .

[2 marks]

Markscheme

$$4x(x - 2) \text{ **(A1)**}$$

$$p = 0 \text{ and } q = 2 \text{ OR } p = 2 \text{ and } q = 0 \text{ **A1**}$$

[2 marks]

The function f can also be expressed in the form $f(x) = 4(x - h)^2 + k$, where $h, k \in \mathbb{R}$.

4c. Find the value of h and the value of k .

[3 marks]

Markscheme

attempt to use valid approach **(M1)**

$$\frac{0+2}{2}, \frac{-(-8)}{2 \times 4}, f(1), 8x - 8 = 0 \text{ OR } 4(x^2 - 2x + 1 - 1) (= 4(x - 1)^2 - 4)$$

$$h = 1, k = -4 \text{ **A1A1**}$$

[3 marks]

4d. Hence find the values of x where the graph of f is both negative and increasing.

[3 marks]

Markscheme

EITHER

recognition $x = h$ to 2 (may be seen on sketch) **(M1)**

OR

recognition that $f(x) < 0$ and $f'(x) > 0$ **(M1)**

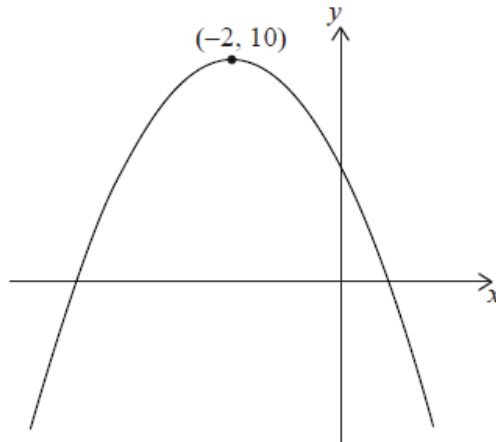
THEN

$1 < x < 2$ **A1A1**

Note: Award **A1** for two correct values, **A1** for correct inequality signs.

[3 marks]

The diagram shows the graph of the quadratic function $f(x) = ax^2 + bx + c$, with vertex $(-2, 10)$.



The equation $f(x) = k$ has two solutions. One of these solutions is $x = 2$.

5. Write down the other solution of $f(x) = k$.

[2 marks]

Markscheme

* This question is from an exam for a previous syllabus, and may contain minor differences in marking or structure. It appeared in a paper that permitted the use of a calculator, and so might not be suitable for all forms of practice.

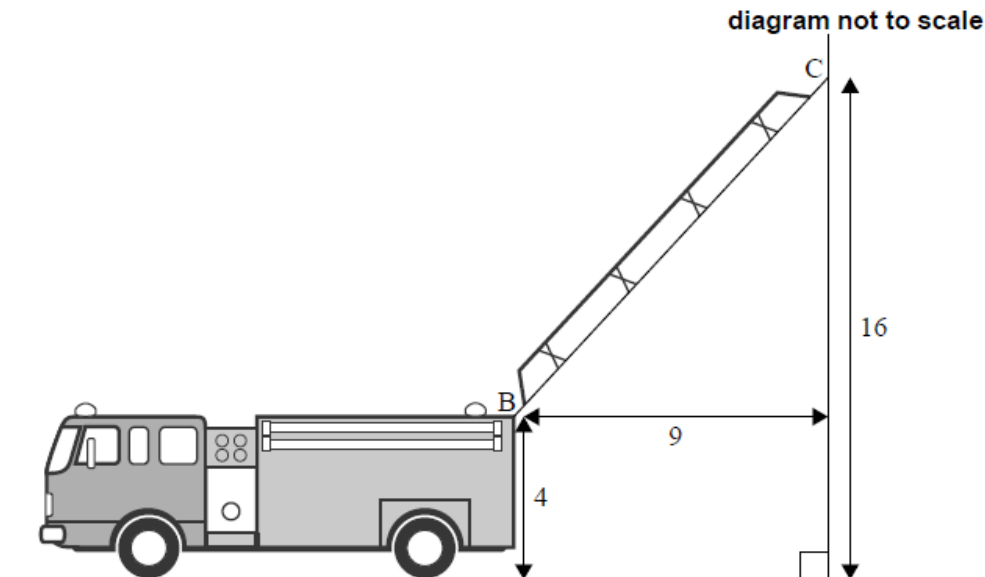
$$(x =) (-2) - 4 \quad \text{OR} \quad (x =) (-2) - (2 - (-2)) \quad (M1)$$

Note: Award **(M1)** for correct calculation of the left symmetrical point.

$$(x =) - 6 \quad (A1) \quad (C2)$$

[2 marks]

A ladder on a fire truck has its base at point B which is 4 metres above the ground. The ladder is extended and its other end rests on a vertical wall at point C, 16 metres above the ground. The horizontal distance between B and C is 9 metres.



6a. Find the angle of elevation from B to C.

[3 marks]

Markscheme

* This question is from an exam for a previous syllabus, and may contain minor differences in marking or structure.

$$\tan B = \frac{12}{9} \quad (\mathbf{A1})(\mathbf{M1})$$

Note: Award **(A1)** for 12 seen, **(M1)** for correct substitution into tan (or equivalent). Accept equivalent methods, such as Pythagoras, to find BC and correct substitution into other trig ratios. If $\tan^{-1}\left(\frac{16}{9}\right)$ seen award **(A0)(M1)** **(A0)**.

$$53.1^\circ \text{ (53.1301...}^\circ) \quad (\mathbf{A1}) \text{ (C3)}$$

Note: If radians are used the answer is 0.927295...; award at most **(A1)(M1)** **(A0)**.

[3 marks]

- 6b. A second truck arrives whose ladder, when fully extended, is 30 metres **[3 marks]** long. The base of this ladder is also 4 metres above the ground. For safety reasons, the maximum angle of elevation that the ladder can make is 70° .

Find the maximum height on the wall that can be reached by the ladder on the second truck.

Markscheme

$$30 \sin 70^\circ + 4 \quad (\mathbf{M1})(\mathbf{M1})$$

Note: Award **(M1)** for $\sin 70^\circ = \frac{x}{30}$ (or equivalent) and **(M1)** for adding 4.

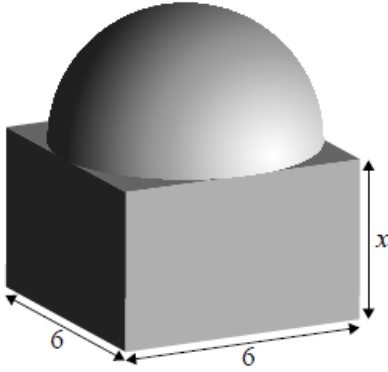
$$32.2 \text{ (32.1907...)} \text{ (m)} \quad (\mathbf{A1}) \text{ (C3)}$$

Note: If radians are used the answer is 27.2167...; award at most **(M1)(M1)** **(A0)**.

[3 marks]

A solid glass paperweight consists of a hemisphere of diameter 6 cm on top of a cuboid with a square base of length 6 cm, as shown in the diagram.

diagram not to scale



The height of the cuboid, x cm, is equal to the height of the hemisphere.

7a. Write down the value of x .

[1 mark]

Markscheme

3 (cm) **(A1) (C1)**

[1 mark]

7b. Calculate the volume of the paperweight.

[3 marks]

Markscheme

units are required in part (a)(ii)

$$\frac{1}{2} \times \frac{4\pi \times (3)^3}{3} + 3 \times (6)^2 \quad \mathbf{(M1)(M1)}$$

Note: Award **(M1)** for **their** correct substitution in volume of sphere formula divided by 2, **(M1)** for adding **their** correctly substituted volume of the cuboid.

$$= 165 \text{ cm}^3 \text{ (164.548...)} \quad \mathbf{(A1)(ft) (C3)}$$

Note: The answer is 165 cm^3 ; the units are required. Follow through from part (a)(i).

[3 marks]

7c. 1 cm^3 of glass has a mass of 2.56 grams.

[2 marks]

Calculate the mass, in grams, of the paperweight.

Markscheme

their $164.548... \times 2.56$ (M1)

Note: Award (M1) for multiplying their part (a)(ii) by 2.56.

= 421 (g) (421.244...(g)) (A1)(ft) (C2)

Note: Follow through from part (a)(ii).

[2 marks]

8. Find the size of the angle of depression of B from P.

[2 marks]

Markscheme

$180 - 48 - 82.2473...$ (M1)

49.8° ($49.7526...^\circ$) (A1)(ft) (C2)

Note: Follow through from parts (a) and (b).

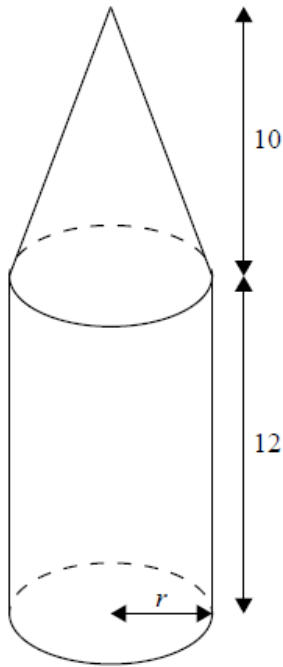
[2 marks]

Julio is making a wooden pencil case in the shape of a large pencil. The pencil case consists of a cylinder attached to a cone, as shown.

The cylinder has a radius of r cm and a height of 12 cm.

The cone has a base radius of r cm and a height of 10 cm.

diagram not to scale



9. Find an expression for the slant height of the cone **in terms of r** . [2 marks]

Markscheme

* This question is from an exam for a previous syllabus, and may contain minor differences in marking or structure.

(slant height² =) $10^2 + r^2$ (M1)

Note: For correct substitution of 10 and r into Pythagoras' Theorem.

$\sqrt{10^2 + r^2}$ (A1) (C2)

[2 marks]