1.   **Are the following statements true? If not, explain in words why not?**

a) $\dfrac{2k}{2x+h} = \dfrac{k}{x+h}$

b) $\dfrac{1}{p+q} = \dfrac{1}{p} + \dfrac{1}{q}$

c) $\dfrac{x+y}{2} = \dfrac{x}{2} + \dfrac{y}{2}$

d) $3\dfrac{a}{b} = \dfrac{3a}{3b}$

e) $3\dfrac{a}{b} = \dfrac{3a}{b}$

f) $3\dfrac{a+b}{c} = \dfrac{3a+b}{c}$

2.   **Simplify**

a) $\dfrac{\frac{x}{2}}{\frac{x}{4}}$

b) $h \div \dfrac{(x+h)}{h}$

c) $\dfrac{\sqrt{x-2}+\frac{5}{\sqrt{x-2}}}{x-2}$

3. Solve: $xy' + y = 1 + y'$ for y'

4. Solve the following quadratic equations.

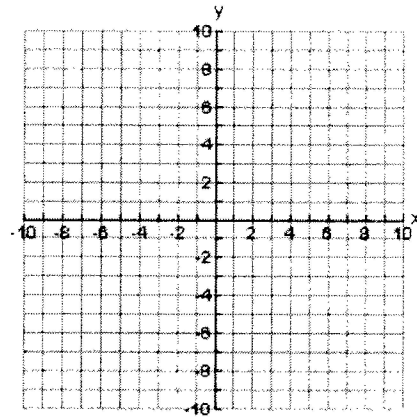a) $4x^2 - 21x - 18 = 0$ b) $2x^2 - 3x + 3 = 0$

c) $x^4 - 9x^2 + 8 = 0$

5. Write as a single factor with denominator in factored form:

$$\frac{7x^2+5x}{x^2+1} - \frac{5x}{x^2-6} = 0$$

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6.   Graph the equation $y = x^3 - x$ and answer the following questions.

    a)   Is the point (3, 2) on the graph?

    b)   Is the point (2, 6) on the graph?

    c)   Is the function even, odd, or neither?

    d)   What is the y-intercept?

    e)   Find the x-intercepts.

7.   Show your work to determine if the relation is odd, even, or neither.

a) $f(x) = 2x^2 - 7$ b) $f(x) = -4x^3 - 2x$ c) $f(x) = 4x^2 - 4x + 4$

8.   Find the equation of the straight line that passes through the point (2, 4) and is parallel to the line $2x + 3y - 8 = 0$.

9.   Find the equation of the line that is perpendicular to the line $2x + 3y - 8 = 0$ at the point (1, 2).

10.   The line with the slope 5 that passes through the point (-1, 3) intersects the x axis at a point. What are the coordinates of this point?

11.   What are the coordinates of the point at which the line passing through the points (1, - 3) and (-2, 4) intersects the y axis?

12.   Given $f(x) = |x - 3| - 5$, find $f(1) - f(5)$.

13.   Given $f(x) = x^2 - 3x + 4$, find $f(x + 2) - f(2)$.

14.   Find the domain of each of the following functions:

a) $h(x) = \dfrac{1}{4x^2 - 21x - 18}$

b) $k(x) = \sqrt{x^2 - 5x - 14}$

b) $p(x) = \dfrac{\sqrt[3]{x-6}}{\sqrt{x^2 - x - 30}}$

d) $y = \ln(2x - 12)$
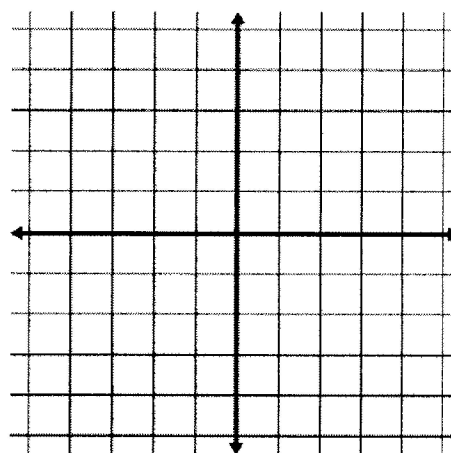
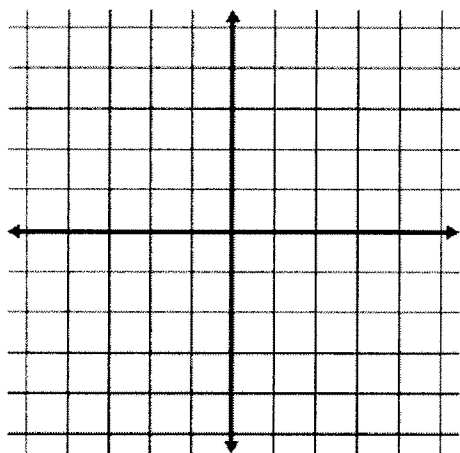15.   Find $f(x + \Delta x)$ for $f(x) = x^2 - 2x - 3$.

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16. Find $\dfrac{f(x+\Delta x)-f(x)}{\Delta x}$ if $f(x) = 8x^2 + 1$.

17. Given $f(x) = \dfrac{1}{x}$ find $\dfrac{f(x+h)-f(x)}{h}$

18. Sketch the graph of each function.

a) $f(x) = \begin{cases} 1 & x \le 0 \\ -1 & x > 0 \end{cases}$

b) $f(x) = \begin{cases} 2x & (-\infty, -1) \\ 2x^2 & [-1, 2) \\ -x + 3 & (-2, \infty) \end{cases}$

19. Given $f(x) = x - 3$ and $g(x) = \sqrt{x}$, complete the following:

a) $f\big(g(x)\big) =$

b) $g\big(f(x)\big) =$

c) $f\big(f(x)\big) =$

20. Given $f(x) = \dfrac{1}{x-5}$ and $g(x) = x^2 - 5$, complete the following:
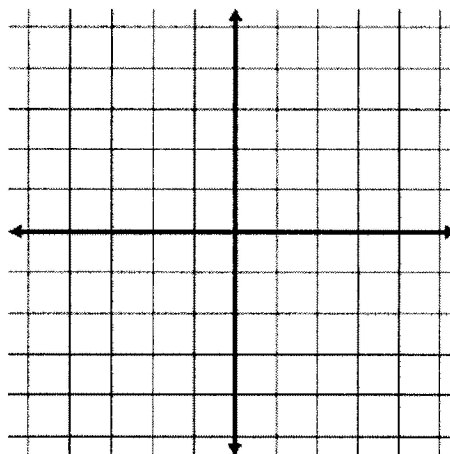
a) $f(g(7)) =$ b) $g(f(v)) =$ c) $g(g(x)) =$

21. Let $f(x) = 2x - 2$. Complete the following:

a) Sketch the graph of $f(x)$.
b) Determine whether f has an inverse function.
c) In another color, sketch the graph of $f^{-1}(x)$.
d) Give the equation for $f^{-1}(x)$.

22. Simplify using only positive exponents. Do not rationalize the denominator.

a) $\dfrac{\sqrt{4x-16}}{\sqrt[4]{(x-4)^3}}$ b) $\left(\dfrac{1}{x^{-2}} + \dfrac{1}{x^{-1}y^{-1}} + \dfrac{1}{y^{-2}} \right)^{-\frac{1}{2}}$

23.   If $f(x) = x^2 - 1$, describe in words what the following would do to the graph of $f(x)$.

a) $f(x) - 4$ b) $f(x - 4)$ c) $-f(x + 2)$

c) $f(x) + 3$ d) $f(2x)$ e) $|f(x)|$

24.   Find the surface area of a box of height h whose base dimensions are p and q, and that satisfies the following condition:
   a)   The box is closed.
   b)   The box has an open top.
   c)   The box has an open top and a square base with side length p.

25.   A seven foot ladder, leaning against a wall, touches the wall x feet above the ground. Write an expression (in terms of x) for the distance from the foot of the ladder to the base of the wall.

26.   A piece of wire 5 inches long is to be cut into two pieces. One piece is x inches long and is to be bent into the shape of a square. The other piece is to be bent into the shape of a circle. Find an expression for the total area made up by the square and the circle as a function of x.

DO NOT USE A CALCULATOR FOR THE FOLLOWING QUESTIONS (27 – 33)

27.   Evaluate: Answer must be in radians.

a) $\cos 0$

b) $\sin 0$

c) $\tan \dfrac{\pi}{2}$

d) $\cos \dfrac{\pi}{4}$

e) $\sin \dfrac{\pi}{2}$

f) $\sin \pi$

g) $arc \cos \dfrac{\sqrt{3}}{2}$

h) $arc \tan 1$

On questions 28 – 30, find the solution to the equations for $0 \le x \le 2\pi$.

28. $2sin^2\theta = 1 - sin\theta$

29. $2tan\theta - sec^2\theta = 0$

30. $sin2\theta = sin\theta = 0$

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31. **Which of the following expressions are identical?**

a) $cos^2 x$
b) $(cos\ x)^2$
c) $cos\ x^2$

32. **Which of the following expressions are identical?**

a) $(sin\ x)^{-1}$
b) $arcsin\ x$
c) $sin\ x^{-1}$
d) $\dfrac{1}{sin\ x}$

33. **Solve for x.**

a) $\ln e^3 = x$
b) $\ln e^x = 4$
c) $\ln x + \ln x = 0$

d) $e^{\ln 5} = x$
e) $\ln 1 - \ln e = 0$
f) $\ln 6 + \ln x - \ln 2 = 3$

g) $\ln(x + 5) = \ln(x - 1) - \ln(x + 1)$

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On questions 34 – 39, determine the following:

a) $\lim_{x \to 1^-} f(x)$
b) $\lim_{x \to 1^+} f(x)$
c) $\lim_{x \to 1} f(x)$

34. $f(x) = \begin{cases} x^2 - 1 & x < 1 \\ 4 - x & x \geq 1 \end{cases}$

35. $f(x) = \begin{cases} 3x - 1 & x \leq 1 \\ 3 - x & x > 1 \end{cases}$

36. $f(x) = \begin{cases} -x^2 & x < 1 \\ 2 & x = 1 \\ x - 2 & x > 1 \end{cases}$

37.

38.

39.