Grandview High School
Honors Algebra 2
Required Summer Assignment

Name: Key

Due Date: **SECOND DAY** OF HALG2 CLASS

Please complete this assignment and bring it to your second day of Honors Algebra 2 class in August. These problems require the use of math skills that are pre-requisites for Honors Algebra 2, which means you should feel *very confident* using these skills *before* you start Honors Algebra 2. An assessment over these concepts will be given in class. **No calculators allowed anywhere on this packet.**

Part 1: Factoring

For a-e, factor each polynomial expression completely. Study the examples and work done below to refresh your memory on factoring. Then apply this knowledge to #'s 1-18 that follow.

a)

$x^2 + 13x - 14$ (+ and ×)

Factors of −14 that add to +13

$-1 \cdot 14$: $-1 + 14 = 13$ ✓

$-2 \cdot 7$: $-2 + 7 = 5$

$(x-1)(x+14)$

b)

$14x^2 - 19x - 3$ (+, −) Guess & Check

$1 \cdot 14$, $2 \cdot 7$; $1 \cdot 3$

$(2x-3)(7x+1)$

Check w/ FOIL:

$14x^2 + 2x - 21x - 3$

$14x^{\checkmark} - 19x^{\checkmark} - 3^{\checkmark}$ (matches orig. prob.)

c)

$4x^3 + 6x^2 - 10x$ GCF first.

$2x(2x^2 + 3x - 5)$ (+, −) ← Factor what's left w/ Guess & check

$2 \cdot 1$; $5 \cdot 1$

$2x(2x+5)(x-1)$

$2x^2 + 5x - 2x - 5$

$2x^{2\checkmark} + 3x^{\checkmark} - 5^{\checkmark}$

d)

$81 - 9y^2$ → Difference of 2 squares

$\sqrt{81} = 9$ $\sqrt{9y^2} = 3y$

$(9+3y)(9-3y)$

e)

$9x^2 - 42x + 49$ Perfect square Trinomial

$\sqrt{9x^2} = 3x$ $\sqrt{49} = 7$

$(3x-7)^2$ or $(3x-7)(3x-7)$

Factor each polynomial expression completely. Write down all work as necessary to share your thought process with the reader.

1) $x^2 - 7x - 18$

$(x-9)(x+2)$

2) $p^2 - 5p - 14$

$(p-7)(p+2)$

3) $m^2 - 9m + 8$

$(m-8)(m-1)$

4) $x^2 - 16x + 63$

$(x-9)(x-7)$

5) $7x^2 - 31x - 20$

$(7x + 4)(x - 5)$

$+4x$

$-35x$

6) $7k^2 + 9k$

$k(7k+9)$

7) $7x^2 - 45x - 28$

$(7x + 4)(x - 7)$

$+4x$

$-49x$

8) $2b^2 + 17b + 21$

$(2b + 3)(b + 7)$

$+3b$

$14b$

9) $5p^2 - p - 18$

$(5p + 9)(p - 2)$

$+9p$

$-10p$

10) $28n^4 + 16n^3 - 80n^2$

$4n^2(7n^2 + 4n - 20)$

$4n^2(7n - 10)(n + 2)$

$-10n$

$+14n$

11) $98n^2 - 200$

$2(49n^2 - 100)$

$2(7n-10)(7n+10)$

12) $3 + 6b + 3b^2$

$3(1 + 2b + b^2)$

$3(1+b)(1+b)$ or $3(1+b)^2$

13) $400 - 36v^2$

$4(100 - 9v^2)$ or $(20+6v)(20-6v)$

$4(10-3v)(10+3v)$

14) $100x^2 + 180x + 81$

$(10x+9)(10x+9)$ or $(10x+9)^2$

$90x$

$90x$

15) $10n^2 + 100n + 250$

$10(n^2 + 10n + 25)$

$10(n+5)(n+5)$ or $10(n+5)^2$

16) $49n^2 - 56n + 16$

$(7n-4)(7n-4)$ or $(7n-4)^2$

$-28n$

$-28n$

17) $49x^2 - 100$

$(7n+10)(7n-10)$

18) $1 - r^2$

$(1+r)(1-r)$

Part 2: Exponent Rules

For a-e, exponent rules were used to simplify the expressions. The final expression only has POSITIVE exponents. Study the examples and work done below to refresh your memory on properties of exponents and operations with exponents. Then apply this knowledge to #'s 1-10 that follow.

a) $\left(5x^{-2}y^{4}\right)^{3}$

$(5x^{-2}y^{4})^{3}$

$= 5^{3}x^{-6}y^{12}$

$\frac{5^{3}y^{12}}{x^{6}}$

$= \boxed{\frac{125y^{12}}{x^{6}}}$

b) $\frac{22y^{6}z^{8}}{2yz^{-7}}$

$\frac{22y^{6}z^{8}}{2yz^{-7}}$

$= \frac{22y^{6}z^{8}z^{7}}{2y^{1}}$

$= \boxed{11y^{5}z^{15}}$

$\frac{22}{2}$ y^{6-1} z^{8+7}

c) $6x^{5}\cdot 3x^{5}\cdot x^{0}$

$6x^{5}\cdot 3x^{5}\cdot x^{0}$

$= 6x^{5}\cdot 3x^{5}\cdot 1$

$= 18x^{5}\cdot x^{5}$

$= \boxed{18x^{10}}$

x^{5+5}

d) $\frac{9a^{-3}b^{5}}{-3ab^{2}}$

$\frac{9a^{-3}b^{5}}{-3a^{1}b^{2}}$

$= \frac{9b^{5}}{-3a^{1}a^{3}b^{2}}$

$= \boxed{\frac{-3b^{3}}{a^{4}}}$ b^{5-2} a^{1+3}

$\frac{9}{-3}$

e) $\frac{12x^{4}y^{7}w^{-3}}{34x^{6}y^{4}w^{8}}$

$\frac{12x^{4}y^{7}w^{-3}}{34x^{6}y^{4}w^{8}}$

$= \frac{12x^{4}y^{7}}{34x^{6}y^{4}w^{8}w^{3}}$

$= \boxed{\frac{6y^{3}}{17x^{2}w^{11}}}$

y^{7-4} bigger exp. on top

w^{8+3}

reduce $\frac{12}{34}$

x^{6-4} bigger exp. on bottom

Use exponent rules to simplify the expressions. The final expression should have only POSITIVE exponents. Write down all work as necessary to share your thought process with the reader.

1) $(x^{-2}x^{-3})^4$

$x^{-8}y^{-12} \rightarrow \boxed{\frac{1}{x^8y^{12}}}$

2) $(x^4)^{-3} \cdot 2x^4$

$x^{-12} \cdot 2x^4 \rightarrow 2x^{-8} \rightarrow \boxed{\frac{2}{x^8}}$

3) $(n^3)^3 \cdot 2n^{-1}$

$n^9 \cdot 2n^{-1} \rightarrow \boxed{2n^8}$

4) $(2v)^2 \cdot 2v^2$

$4v^2 \cdot 2v^2 \rightarrow \boxed{8v^4}$

5) $\frac{2x^2y^4 \cdot 4x^2y^4 \cdot 3x}{3x^{-3}y^2}$ $\frac{24x^5y^8}{3x^{-3}y^2}$

$\boxed{8x^8y^6}$

6) $\frac{2y^3 \cdot 3xy^3}{3x^2y^4}$ $\frac{6xy^6}{3x^2y^4} \rightarrow \boxed{\frac{2y^2}{x}}$

7) $\frac{x^3y^3 \cdot x^3}{4x^2}$ $\frac{x^6y^3}{4x^2} \rightarrow \boxed{\frac{x^4y^3}{4}}$

8) $\frac{3x^2y^2}{2x^{-1} \cdot 4yx^2}$ $\frac{3x^2y^2}{8xy} \rightarrow \boxed{\frac{3xy}{8}}$

9) $\frac{x}{(2x^0)^2}$ $\frac{x}{(2)^2} \rightarrow \boxed{\frac{x}{4} \text{ or } \frac{1}{4}x}$

10) $\frac{2m^{-4}}{(2m^{-4})^3}$ $\frac{2m^{-4}}{2^3m^{-12}} \rightarrow \frac{2m^{-4}}{8m^{-12}}$

$\frac{1m^8}{4}$

$\boxed{\frac{m^8}{4}}$

Part 3: Linear Equations and Graphs

For a-c, graphing and writing equations of lines in slope-intercept form and point-slope form are reviewed. Study the examples and work done below to refresh your memory on equations of lines. Then apply this knowledge to #'s 1-8 that follow.

a)

$y = \frac{1}{2}x + 3$ $y = mx + b$ slope-intercept form of a line

$m = 1/2$

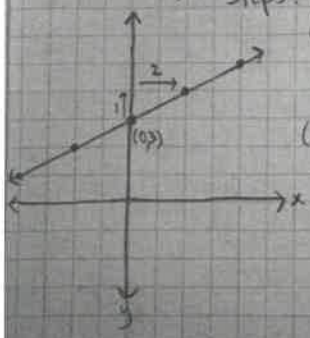
$b = (0,3)$

m = slope

b = y-intercept

* positive lines rise to the right *

steps: ① plot y-int. 1st ② apply slope to y-int. to find more points on the line (note: slope is $\frac{y}{x}$ or $\frac{\text{rise}}{\text{run}}$)



b)

$y - 4 = -\frac{1}{3}(x+2)$ $y - y_1 = m(x - x_1)$ point-slope form of a line

$m = -\frac{1}{3}$

m = slope

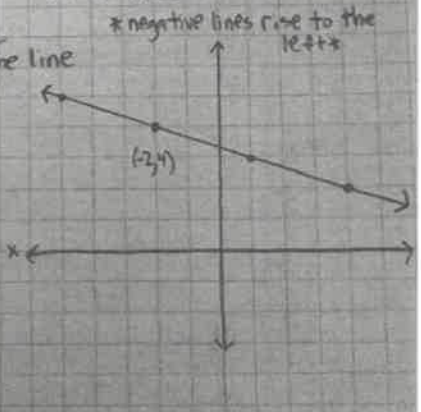
(x_1, y_1) = a specific point on the line

* negative lines rise to the left *

pt. on the line showing in the equation: $(-2,4)$

steps: ① plot the given point 1st ② apply slope to this point to find more points on the line

(note: slope of $-\frac{1}{3}$ is same as $\frac{-1}{3}$ & $\frac{1}{-3}$)



c)

$-2x + 3y = 12$ $Ax + By = C$ standard form of a line

method 1 - graph by x & y-intercepts

steps: ① calculate the x-intercept & the y-intercept ② Plot these 2 points & graph the line

x-intercept $y = 0$

$-2x + 3(0) = 12$

$-2x = 12$

$x = -6$

$(-6,0)$

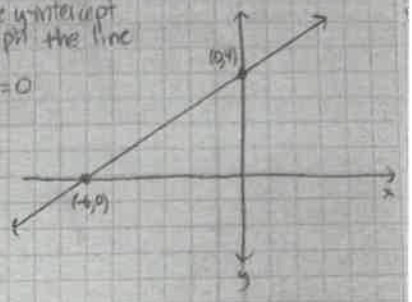
y-intercept $x = 0$

$-2(0) + 3y = 12$

$3y = 12$

$y = 4$

$(0,4)$



method 2 - put into slope-intercept form & graph

steps: ① solve equation for y ② Identify the slope & the y-intercept & graph accordingly

$-2x + 3y = 12$

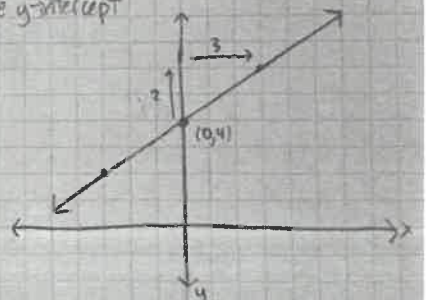
$+2x \quad +2x$

$\frac{3y}{3} = \frac{2x}{3} + \frac{12}{3}$

$y = \frac{2}{3}x + 4$

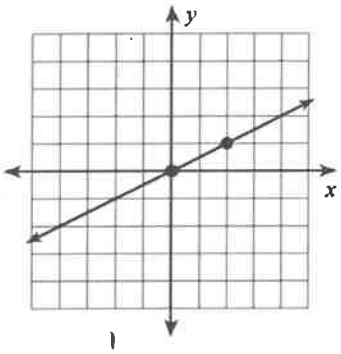
$m = 2/3$

$b = (0,4)$



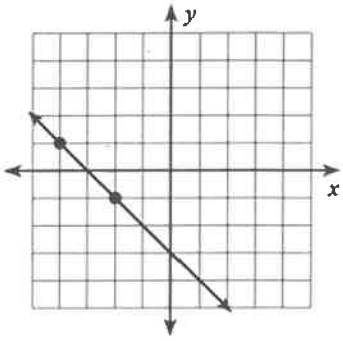
For #'s 1-4, write the equations of the given lines in both A) POINT-SLOPE form $(y - y_{1)} = m(x - x_1)$ and B) SLOPE- INTERCEPT form $(y = mx + b)$. Write down all work as necessary to share your thought process with the reader. Assume each box equals one unit.

1)



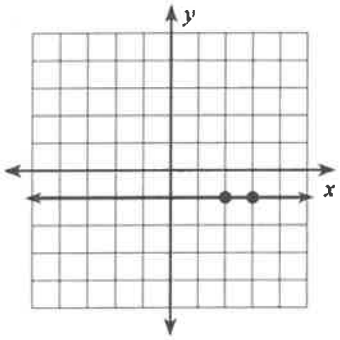
1) $y = \frac{1}{2}x$

2)



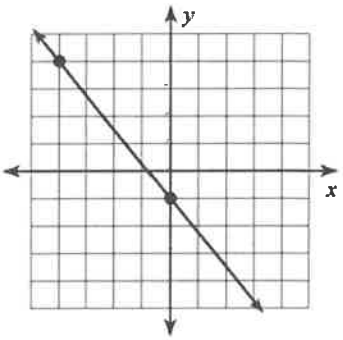
2) $y = -x - 3$

3)



3) $y = -1$

4)



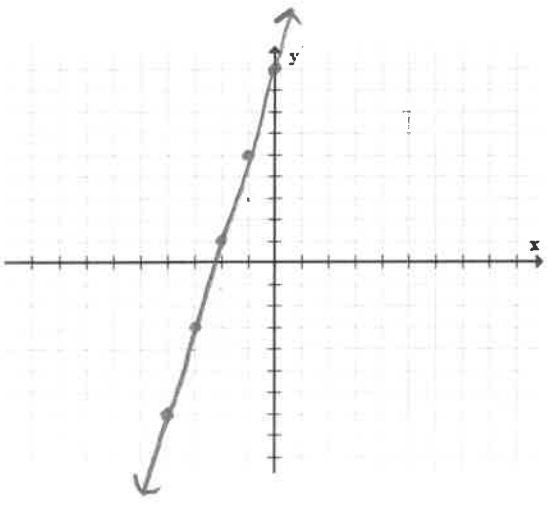
4) $y = -5/4\,x - 1$

For #'s 5 – 8, graph the equation of the line given. Be sure to state the information that is asked for.

5) $y = 4x + 9$

m = 4

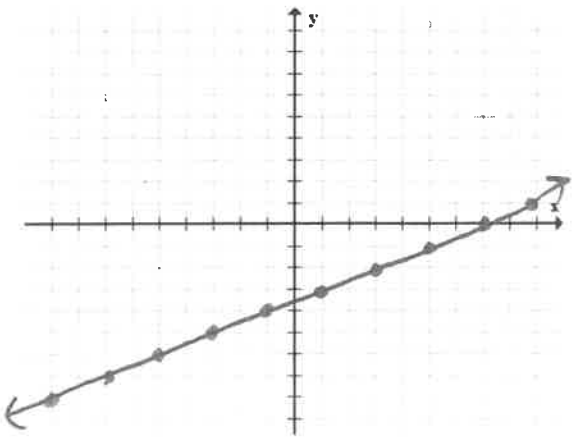
b = (0,9)



6) $y + 3 = \frac{1}{2}(x - 1)$

m = 1/2

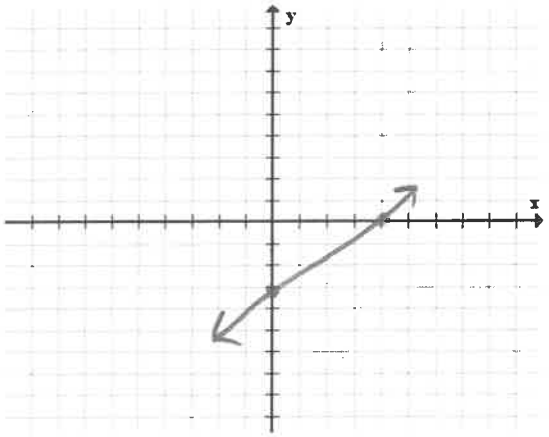
pt. on line: (1,-3)



7) $3x-4y=12$

x-int.: (4, 0) $y=0$ $3x-4(0)=12$, $3x=12$, $x=4$

y-int.: (0, -3) $x=0$ $3(0)-4y=12$, $-4y=12$, $y=-3$



or

$3x-4y=12$

$-3x \quad -3x$

$-4y=-3x+12$

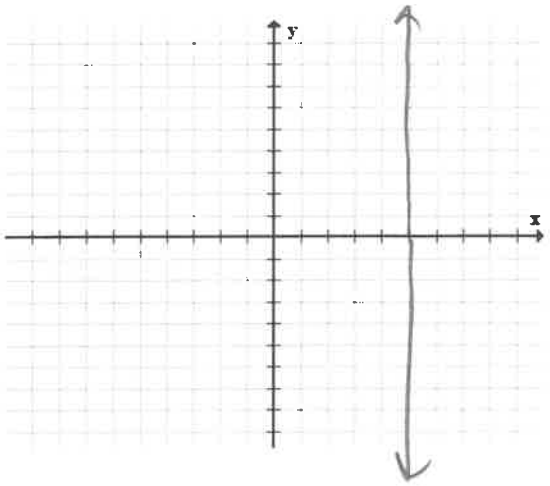
$\frac{-4y}{-4}=\frac{-3x}{-4}+\frac{12}{-4}$

$y=\frac{3}{4}x-3$

8) $x=5$

m = undefined

b = none



Part 4: Solving Systems of Equations

For a-c, solving systems of equations is reviewed. Study the examples and work done below to refresh your memory on solving systems of equations by elimination and substitution. Then apply this knowledge to #'s 1-9 that follow.

a) $6x+7y=19$
$x+y=5$ ← solve for x or y & substitute in for that variable into the other equation

$x=5-y$

$6(5-y)+7y=19$
$30-6y+7y=19$
$y=-11$

$x=5-(-11)$
$x=16$

solution: $(16,-11)$ ← this is the point where the 2 lines intersect

b) $3x+2y=-15$
$2x-5y=-29$

To solve by elimination, add the 2 equations together so x or y cancels out. The coefficients in front of that variable must be the same but opposite sign. In this example, let's eliminate the y's.

$5(3x+2y=-15)$ → $15x+10y=-75$
$2(2x-5y=-29)$ → $+4x-10y=-58$

$19x=-133$
$x=-7$ ← substitute back into either eqtn to solve for y

$3(-7)+2y=-15$
$-21+2y=-15$
$2y=6$
$y=3$

solution: $(-7,3)$ ← this is the point where the 2 lines intersect

c) $x^2+y^2=25$
$x-y=1$ ← * most efficient to solve this non-linear system by substitution rather than elimination since you cannot distribute a square or square root *

$x=1+y$

$(1+y)^2+y^2=25$
$(1+y)(1+y)+y^2=25$
$1+2y+y^2+y^2=25$
$2y^2+2y+1=25$ ← this results in a quadratic... most efficient to try & solve by factoring

$2y^2+2y-24=0$
$y^2+y-12=0$
$(y+4)(y-3)=0$
$y+4=0 \quad y-3=0$
$y=-4 \quad y=3$

$x=1+y$
$x=1+-4$ $\quad$ $x=1+3$
$x=-3$ $\quad$ $x=4$

solutions: $(-3,-4)$ & $(4,3)$

* this was a circle intersecting a line so they are crossing twice *

For #'s 1 - 3, solve the following systems of equations by substitution.

1) $y = 6x - 11$

$-2x - 3y = -7$

$-2x - 3(6x - 11) = -7$

$-2x - 18x + 33 = -7$

$-20x = -40$

$x = 2$

$y = 6(2) - 11$

$y = 12 - 11$

$y = 1$

$(2, 1)$

2) $-3x + 3y = 4$

$-x + y = 3$

$y - 3 = x$

$-3(y - 3) + 3y = 4$

$-3y + 9 + 3y = 4$

$9 = 4$

No solution

lines are parallel

3) $5x + 2y = 9$

$x + 2y = 1$

$x = 1 - 2y$

$5(1 - 2y) + 2y = 9$

$5 - 10y + 2y = 9$

$5 - 8y = 9$

$-8y = 4$

$y = -1/2$

$x = 1 - 2(-1/2)$

$x = 1 + 1$

$x = 2$

$(2, -1/2)$

For #'s 4 – 6, solve the following systems of equations by elimination.

4) $(5x + y = 9)7$ → $35x + 7y = 63$

$10x - 7y = -18$ → $+ 10x - 7y = -18$

$45x = 45$

$x = 1$

$5(1) + y = 9$

$5 + y = 9$

$y = 4$

$(1, 4)$

5) $(6x + 2y = 0)2$ → $12x + 4y = 0$

$-9x - 4y = 1$ → $+ -9x - 4y = 1$

$3x = 1$

$x = 1/3$

$6(\frac{1}{3}) + 2y = 0$

$2 + 2y = 0$

$2y = -2$

$y = -1$

$(1/3, -1)$

6) $(2x + 8y = 6)5$

$(-5x - 20y = -15)2$ →

$10x + 40y = 30$

$-10x - 40y = -30$

$0 = 0$

infinitely many solutions...

same line

For #'s 7 – 9, solve the following systems of equations by the method of your choice.

7) $y = 3x - 5$

$x^2 + y^2 = 5$

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

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

$x^2 + 9x^2 - 15x - 15x + 25 = 5$

$10x^2 - 30x + 20 = 0$

$x^2 - 3x + 2 = 0$

$(x-2)(x-1) = 0$

$x-2=0 \qquad x-1=0$

$x=2 \qquad x=1$

$y=3(2)-5 \qquad y=3(1)-5$

$y=1 \qquad y=-2$

$(2,1) \qquad (1,-2)$

8) $y = x^2 + 2$

$x - y = -4$

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

$x - x^2 - 2 = -4$

$0 = x^2 - x - 2$

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

$x-2=0 \qquad x+1=0$

$x=2 \qquad x=-1$

$y=(2)^2+2 \qquad y=(-1)^2+2$

$y=6 \qquad y=3$

$(2,6) \qquad (-1,3)$

9) $4x - y = 20$

$-2x - 2y = 10$

-2

$-8x + 2y = -40$

$+ \quad -2x - 2y = 10$

$-10x = -30$

$x = 3$

$-2(3) - 2y = 10$

$-6 - 2y = 10$

$-2y = 16$

$y = -8$

$(3,-8)$