Prerequisite skills for Algebra II Level 2

- solving linear equations/inequalities and absolute value equations/inequalities
- functions vs. relations
- graphing functions from tables of values
- finding x and y intercepts from standard form
- writing equations in point-slope, slope intercept, standard form
- solving systems of equations (2 variables)
- systems of linear inequalities
- quadratic factoring and including $a \neq 1$
- simplifying square roots
- solving quadratics by factoring, square roots, quadratic formula, or completing the square
- simplifying, multiplying and dividing rational expressions, including domain restrictions

Solving linear absolute value equations/inequalities

1. $\frac{3}{4}x + 7 = 16$

   $\left(\frac{4}{3}\right)\left(\frac{3}{4}\right)x = 9\left(\frac{4}{3}\right)$

   x = 12

2. | x – 3 |=10

   $x - 3 = 10, x - 3 = -10$

   $x = 13, x = -7$

3. -2|2x + 3| = 16

   $|2x + 3| = -8$

   ∅

   No absolute value = negative

4. Solve for m in y = mx + b

   $y - b = mx$

   $\frac{y - b}{x} = m$

5. Solve for w in P = 2l + 2w

   $p - 2l = 2w$

   $\frac{p - 2l}{2} = w$

6. $\frac{-|2x-1|}{6} = -5$

$-|2x-1| = -30$

$|2x-1| = 30$

$2x-1 = \pm 30$

$2x = 31, 2x = -29$

$x = \frac{31}{2}, x = -\frac{29}{2}$

7. $\frac{2}{3}s - 4 = \frac{1}{4}s - \frac{1}{2}$

$12(\frac{2}{3}s - 4 = \frac{1}{4}s - \frac{1}{2})$

$8s - 48 = 3s - 6$

$5s = 42$

$s = \frac{42}{5}$

8. $\frac{4}{5}x + 3 = \frac{2}{15}x - \frac{3}{10}$

$30(\frac{4}{5}x + 3 = \frac{2}{15}x - \frac{3}{10})$

$24x + 90 = 4x - 9$

$20x = -99$

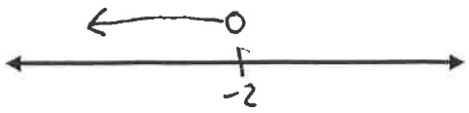
$x = -\frac{99}{20}$

9. Solve for x. Then graph your answer on the number line.

a. $-3x + 2 > 8$

-3x > 6

x < -2

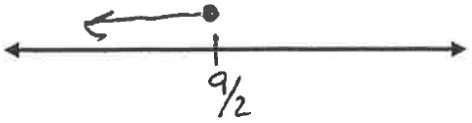


b. $-4x + 3 \leq -6x + 12$

-9 ≤ -2x

$\frac{9}{2} \geq x$

$x \leq \frac{9}{2}$



c. $5x + 25 < 0 \cup 6x - 36 > 0$

5x < -25 6x >36

x < -5 x > 6

d. $2x - 10 < -2 \cap x + 3 > -15$

2x < 8 x>-18

x < 4

e. | x + 5 | ≤ 15

$x + 5 \leq 15, x + 5 \geq -15$

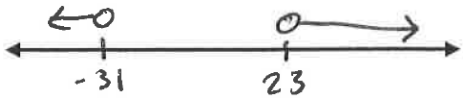
$x \leq 10, x \geq -20$

f. $\frac{|x+4|}{3} > 9$

$|x + 4| > 27$

$x + 4 > 27, x + 4 < -27$

$x > 23, x < -31$



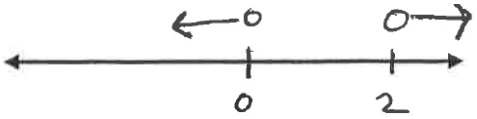
g. $14 - 2 | x - 1 | < 12$

$-2|x - 1| < -2$

$|x - 1| > 1$

$x - 1 > 1, x - 1 < -1$

$x > 2, x < 0$

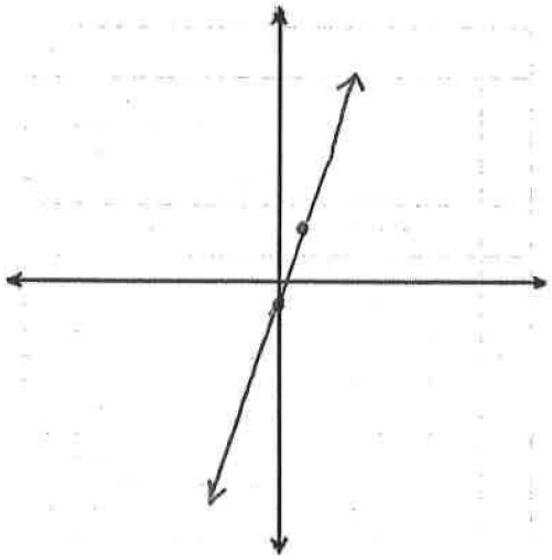


Graphing from tables of values

10. *Create a table for each and graph the function*

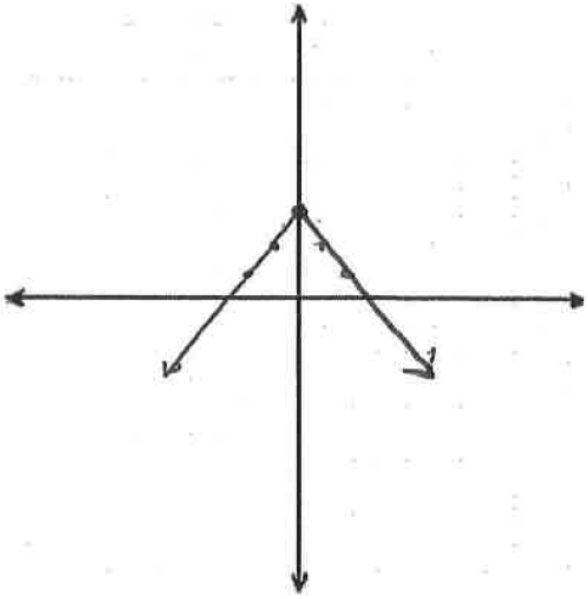
a) y = 3x – 1

x	y
-2	-7
-1	-4
0	-1
1	2
2	5



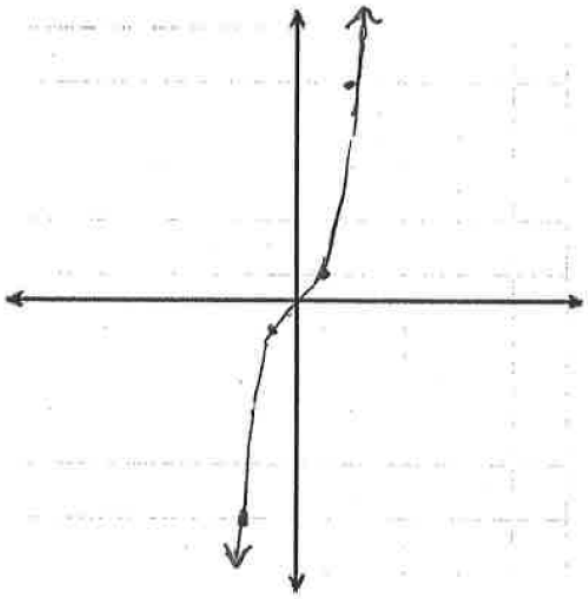
b) $y = -|x| + 3$

x	y
-2	1
-1	2
0	3
1	2
2	1



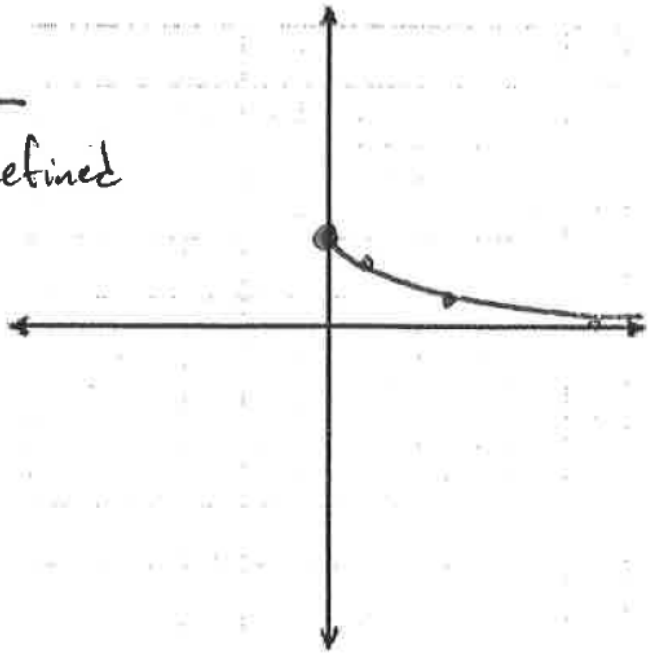
c) $y = x^3$

x	y
-2	-8
-1	-1
0	0
1	1
2	8



d) $y = 3 - \sqrt{x}$

x	y
-1	undefined
0	3
1	2
4	1
9	0



11. a. Write the equation of a line that crosses through G(-4, 5) and H(-2, -1).

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1 - 5}{-2 - (-4)} = \frac{-6}{2} = -3$$

$y - y_1 = m(x - x_1)$
y-5 = -3(x+4)
y-5 = -3x-12
y = -3x-7

b. Write an equation of a line parallel to the line in part (a).
y = -3x+anything
example: y = -3x+2

c. Write an equation of a line perpendicular to the line in part (a).
Perpendicular slope (opposite and reciprocal)

$$\frac{-3}{1} \rightarrow \frac{1}{3}$$

$y = \frac{1}{3}x + anything$
example: $y = \frac{1}{3}x + 4$

d. What type of angle do the lines in parts b and c create at their intersection?
Right angle.

12. Write an equation of a line that crosses through F(5, 7) and M(-3, -1) in the following forms:

Slope-Intercept

$$m = \frac{-1 - 7}{-3 - 5} = \frac{-8}{-8} = 1$$

y = x+2

Point-Slope
y-7=1(x-5)
y-7=x-5
y=x+2

Standard
y=x+2
y-x=2
-x+y=2

13. Solve each system of equations:

$\begin{cases} 3x + 9y = 9 \\ y = \frac{2}{3}x - 2 \end{cases}$

$3x + 9(\frac{2}{3}x - 2) = 9$

$3x + 6x - 18 = 9$

$9x=27$

$x=3$

$y = \frac{2}{3}(3) - 2$

$y=2-2$

$y=0$

Answer is $(3,0)$

$\begin{cases} y = -2x + 9 \\ 3x - 4y = 8 \end{cases}$

$3x - 4(-2x + 9) = 8$

$3x + 8x - 36 = 8$

$11x=44$

$x=4$

$y = -2(4) + 9 = -8 + 9 = 1$

Answer is $(4,1)$

$\begin{cases} -2x + 7y = 10 \\ x - 3y = -3 \end{cases}$

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

$2x - 6y = -6$

$2x - 6y = -6$

$\underline{-2x + 7y = 10}$

$y=4$

$x = 3y - 3 = 3(4) - 3 = 9$

Answer is $(9,4)$

14. At a recent concert, there were 1500 people. Adult tickets were \$12 each and student tickets were 50% off the adult price. If the concert profit was \$15,600, find the number of adult and student tickets sold.

$12A + 6S = 15600$
$-6(A + S = 1500)$

$12A + 6S = 15600$
$\underline{-6A - 6S = -9000}$
6A = 6600
A = 1100

S = 1500-A = 1500-1100
S = 400

Factoring and solving polynomials

15. *Factor the following completely or state that it is prime:*

a) $9x^2 - 36$
$9(x^2 - 4)$
$9(x - 2)(x + 2)$

b) $8x^2 + 25x + 3$
$(8x + 1)(x + 3)$

c) $6x^2 - 30x - 36$
$6(x^2 - 5x - 6)$
$6(x - 6)(x + 1)$

d) $x^2 - 10x + 25$
$(x - 5)^2$

e) $6x^3 - 12x^2$
$6x^2(x - 2)$

f) $3x^2 + x - 10$
$(3x - 5)(x + 2)$

g) $2x^3 - 14x^2 + 24x$
$2x(x^2 - 7x + 12)$
$2x(x - 4)(x - 3)$

h) $3x^2 + 17x + 10$
$(3x + 2)(x + 5)$

i) $4y^2 + 14y + 6$
$2(2y^2 + 7y + 3)$
$2(2y + 1)(y + 3)$

j) $6x^2 - 12x - 18$
$6(x^2 - 2x - 3)$
$6(x - 3)(x + 1)$

Simplifying square roots. *Simplify each.*

a.) $\sqrt{98} = \sqrt{49}\sqrt{2} = 7\sqrt{2}$

b.) $\sqrt{72} = \sqrt{36}\sqrt{2} = 6\sqrt{2}$

c.) $\sqrt{108} = \sqrt{27}\sqrt{4} = 2\sqrt{9}\sqrt{3} = 6\sqrt{3}$

d.) $2\sqrt{6} \cdot 5\sqrt{3} = 10\sqrt{18} = 10\sqrt{9}\sqrt{2} = 30\sqrt{2}$

e.) $\sqrt{15} \cdot \sqrt{10} = \sqrt{150} = \sqrt{25}\sqrt{6} = 5\sqrt{6}$

f.) $\frac{\sqrt{50}}{\sqrt{2}} - \sqrt{20} = \sqrt{25} - \sqrt{20} = 5 - 2\sqrt{5}$

g.) $\sqrt{20} - \sqrt{200} + \sqrt{45} = 2\sqrt{5} - 10\sqrt{2} + 3\sqrt{5} = 5\sqrt{5} - 10\sqrt{2}$

h.) $\sqrt{\frac{32}{50}} = \frac{\sqrt{32}}{\sqrt{50}} = \frac{\sqrt{16}\sqrt{2}}{\sqrt{25}\sqrt{2}} = \frac{4}{5}$

i.) $\frac{\sqrt{120}}{\sqrt{20}} = \sqrt{6}$

Solving quadratics. *Solve for x using any appropriate method*

a.) $x^2 - 3x = 4$
$x^2 - 3x - 4 = 0$
$(x - 4)(x + 1) = 0$
x = 4, x = -1

b.) $x^2 = 10x - 25$
$x^2 - 10x + 25 = 0$
$(x - 5)(x - 5) = 0$
x = 5

c.) $x^2 - 6x + 8 = 0$
$(x - 4)(x - 2) = 0$
x = 4, x = 2

d.) $3x^2 - 7x + 2 = 0$

$(3x - 1)(x - 2) = 0$

$x = \frac{1}{3}, x = 2$

e.) $x^2 - 3x + 1 = 6$

$x^2 - 3x - 5 = 0$

a=1, b=-3, c=-5

$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(1)(-5)}}{2(1)} = \frac{3 \pm \sqrt{9 + 20}}{2} = \frac{3 \pm \sqrt{29}}{2}$

f.) $4x^2 + 7x + 2 = 0$

a=4, b=7, c=2

$x = \frac{-7 \pm \sqrt{(7)^2 - 4(4)(2)}}{2(4)} = \frac{-7 \pm \sqrt{49 - 32}}{8} = \frac{-7 \pm \sqrt{17}}{8}$

Rational Expressions. *Multiply, divide, simplify. State any restrictions.*

a.) $\frac{3x-12}{8x+12} \cdot \frac{12x+8}{5x-20}$

$= \frac{3\cancel{(x-4)}}{4(2x+3)} \cdot \frac{4(3x+2)}{5\cancel{(x-4)}}$

$= \frac{3(3x+2)}{5(2x+3)}$

$x \neq -\frac{3}{2}, 4$

b.) $\frac{3x^2}{5y^3} \div \frac{9x^8}{15y^6}$

$= \frac{3x^2}{5y^3} \cdot \frac{15y^6}{9x^8} = \frac{3x^2y^6}{3x^8y^3} = \frac{y^3}{x^6}$

$x, y \neq 0$

c.) $\frac{x^2+4x}{x-5} \div \frac{x^2-x-20}{2}$

$= \frac{x\cancel{(x+4)}}{(x-5)} \cdot \frac{2}{(x-5)\cancel{(x+4)}} = \frac{2x}{(x-5)(x-5)}$

$x \neq 5, -4$

d.) $\frac{x^2-6x+5}{x^2-x-20} \cdot \frac{x^2-16}{1-x^2}$

$= \frac{\cancel{(x-5)}\cancel{(x-1)}}{\cancel{(x-5)}(x+4)} \cdot \frac{(x-4)\cancel{(x+4)}}{(-1)\cancel{(x-1)}(x+1)} = -\frac{x-4}{x+1}$

$x \neq 5, -4, \pm 1$

e.) $\frac{x^2+4x+4}{x^2-4}$

$= \frac{(x+2)\cancel{(x+2)}}{(x-2)\cancel{(x+2)}} = \frac{x+2}{x-2}$

$x \neq \pm 2$

f.) $\frac{x^2+5x-6}{x^2-4x+4}$

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

$x \neq 2$