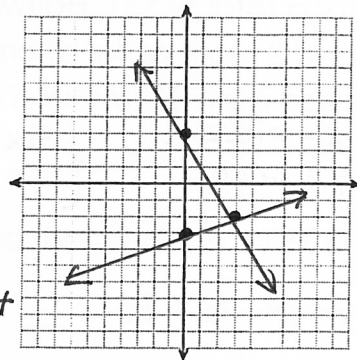


Name: Key

ALGEBRA 2 SEMESTER 1 FINAL REVIEW

NC means non-calculator

Unit 1: Linear and Non-Linear Systems



- 1) NC Solve the following system of equations:
- $$\begin{cases} y = -\frac{5}{3}x + 3 \\ y = \frac{1}{3}x - 3 \end{cases}$$
- where the lines cross $(3, -2)$
- slope $\uparrow$ y-intercept

- 2) NC Solve the following system of equations using substitution:
- $$\begin{cases} y = 6x - 11 \\ -2x - 3y = -7 \end{cases}$$
- $-2x - 3(6x - 11) = -7$
 $-2x - 18x + 33 = -7$
 $-20x + 33 = -7$
 $-20x = -40$
 $x = 2$
- Plug 2 into one of the equations to find y.
 $y = 6(2) - 11$
 $y = 1$
- $(2, 1)$

- 3) NC Solve the following system of equations using elimination:
- $$\begin{cases} 5x + y = 9 \\ 10x - 7y = -18 \end{cases}$$
- $-2(5x + y = 9)$ Now, $-10x - 2y = -18$
 $+ 10x - 7y = -18$
 $-9y = -36$
 $y = 4$
- Plug it back in:
 $5x + 4 = 9$
 $5x = 5$
 $x = 1$
- $(1, 4)$

- 4) NC Solve the following systems of equations using the method of your choice.

$$\begin{cases} y = 5x - 7 \\ -3x - 2y = -12 \end{cases}$$

$-3x - 2(5x - 7) = -12$
 $-3x - 10x + 14 = -12$
 $-13x + 14 = -12$
 $-13x = -26$
 $x = 2$

$y = 5(2) - 7$
 $y = 10 - 7$
 $y = 3$

$(2, 3)$

$$\begin{cases} -4x + 9y = 9 \\ 3(x - 3y = -6) \end{cases}$$

$-4x + 9y = 9$
 $+ 3x - 9y = -18$
 $-1x = -9$
 $x = 9$

Plug it back in:
 $9 - 3y = -6$
 $-3y = -15$
 $y = 5$

$(9, 5)$

$$\begin{cases} y = \frac{1}{3}x - 3 \\ y = -x + 1 \end{cases}$$

*Graph or use substitution

$\frac{1}{3}x - 3 = -x + 1$
 $\frac{1}{3}x + x = 4$
 $\frac{4}{3}x = 4$
 $x = 3$

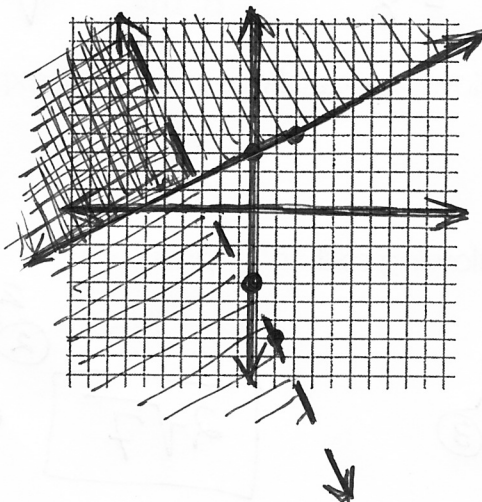
Plug it back in:
 $y = -(3) + 1$
 $y = -2$

$(3, -2)$

- 5) NC Graph the following system of inequalities. Then, circle the points below that are solutions to the system.

$y < -3x - 4$

$y \geq \frac{1}{2}x + 3$



Circle the solutions to the system:

$(0, 0)$
 Not in $\uparrow$
 double shaded
 region.

$(-4, 3)$

$(-7, 1)$

Are
 in double
 shaded region.

6) NC Maria is hosting a party. She places an order at Pizza Hut for 5 pizzas and 4 breadsticks for a total of \$51. Halfway through the party, she realizes that she will need one more pizza and 2 more order of breadsticks. This time she was given a total of \$15. How much does a pizza cost? How much does a breadstick cost?

$x = \text{pizza}$
 $y = \text{bread}$

$$\begin{cases} 5x + 4y = 51 \\ 1x + 2y = 15 \end{cases}$$

Solve:

$$\begin{aligned} 5x + 4y &= 51 \\ -2x - 4y &= -30 \\ \hline 3x &= 21 \\ x &= 7 \end{aligned}$$

Plug it back in:

$$\begin{aligned} 1x + 2y &= 15 \\ 7 + 2y &= 15 \\ 2y &= 8 \\ y &= 4 \end{aligned}$$

Pizza = \$7
bread = \$4

7) Solve each system below.

$$y = x^2 - 8x + 12$$

$$y = 4x - 8$$

$$\begin{aligned} x^2 - 8x + 12 &= 4x - 8 \\ -4x & \quad -4x \\ \hline x^2 - 12x + 12 &= -8 \\ +8 & \quad +8 \\ \hline x^2 - 12x + 20 &= 0 \end{aligned}$$

Factor or use the quadratic formula.

$$(x - 10)(x - 2) = 0$$

$$-10 = 0; x = 10 \quad x - 2 = 0; x = 2$$

$$\begin{pmatrix} 10, 32 \\ 2, 0 \end{pmatrix}$$

$$y = x^2 - 9x + 18$$

$$y = x - 3$$

$$\begin{aligned} x &= 7 \\ x &= 3 \end{aligned}$$

Factor

$$(x - 7)(x - 3) = 0$$

$$\begin{aligned} x - 7 &= 0 \quad \text{or} \quad x - 3 = 0 \\ x &= 7 \quad \text{or} \quad x = 3 \end{aligned}$$

$$\begin{aligned} x^2 - 9x + 18 &= x - 3 \\ -x & \quad -x \\ \hline x^2 - 10x + 18 &= -3 \\ +3 & \quad +3 \\ \hline x^2 - 10x + 21 &= 0 \end{aligned}$$

Quadratic Formula

$$\frac{10 \pm \sqrt{100 - 4(1)(21)}}{2(1)}$$

$$\frac{10 \pm \sqrt{16}}{2}$$

$$\frac{10 + 4}{2} = 7 \quad \frac{10 - 4}{2} = 3$$

Unit 2: Radicals and Rational Exponents

1) Solve each following radical equation. Determine whether each solution is extraneous.

a. $\sqrt{3x - 5} - 5 = 2$

$$(\sqrt{3x - 5})^2 = (7)^2$$

$$3x - 5 = 49$$

$$\begin{aligned} 3x - 5 &= 49 \\ +5 & \quad +5 \\ \hline 3x &= 54 \\ \div 3 & \quad \div 3 \\ \hline x &= 18 \end{aligned}$$

b. $\sqrt{90 - x} = (x)^2$

$$\begin{aligned} 90 - x &= x^2 \\ -90 & \quad -x \\ \hline 0 &= x^2 + x - 90 \end{aligned}$$

$$0 = (x + 10)(x - 9)$$

$$\begin{aligned} x + 10 &= 0 \\ -10 & \quad -10 \\ \hline x &= -10 \end{aligned}$$

extraneous

$$\begin{aligned} x - 9 &= 0 \\ +9 & \quad +9 \\ \hline x &= 9 \end{aligned}$$

$$x = 9$$

* Plug them back in to confirm they work.

$$\sqrt{90 - (-10)} = -10$$

$$\sqrt{90 - 9} = 9 \checkmark$$

c. $\sqrt{x - 5} = \sqrt{10 - 2x}$

$$x - 5 = 10 - 2x$$

$$3x - 5 = 10$$

$$3x = 15$$

$$x = 5$$

2) NC Rewrite the following equations in radical form. Simplify if possible.

a. $64^{\frac{1}{2}} \sqrt{64} = 8$

b. $m^{\frac{3}{5}} \sqrt[5]{m^3}$

c. $(2x)^{\frac{1}{3}} \sqrt[3]{(2x)}$

3) NC Rewrite the following equations in rational exponent form.

a. $\sqrt[5]{x^3} x^{\frac{3}{5}}$

b. $(\sqrt{10})^3 10^{\frac{3}{2}}$

c. $\sqrt[6]{2} 2^{\frac{1}{6}}$

4) NC Simplify the following radical expressions.

a. $-3\sqrt{18}$

$$\begin{aligned} &2^{\frac{18}{2}} \\ &2^9 \\ &3^{\frac{18}{2}} \\ &3^9 \end{aligned}$$

$$\begin{aligned} &-3 \cdot 3 \sqrt{2} \\ &= -9\sqrt{2} \end{aligned}$$

b. $\sqrt{28}$

$$2\sqrt{7}$$

$$\begin{aligned} &2^{\frac{28}{2}} \\ &2^{14} \\ &2^7 \end{aligned}$$

c. $\sqrt{50}$

$$5\sqrt{2}$$

$$\begin{aligned} &50 \\ &2^{\frac{50}{2}} \\ &2^{25} \\ &5^{\frac{50}{2}} \\ &5^{25} \end{aligned}$$

5) Use exponent rules to simplify the following expressions. Your answer should have only positive exponents and no repeated bases.

a. $NC \left(\frac{tp^5}{t^{-3}p^2} \right)^{-2}$

$$\frac{t^{-2} p^{-10}}{t^{+6} p^{-4}}$$

$$= t^{-2-(+6)} p^{-10-(-4)} = t^{-8} p^{-6} = \frac{1}{t^8 p^6}$$

b. $(7p^2)^{5/6}$

$$= 7^6 p^{5/2 \cdot \frac{6}{1}} = 7^6 p^{15}$$

c. $\frac{1}{3} \frac{x^{\frac{1}{4}}}{x^{-\frac{5}{3}}}$

$$= \frac{1}{3} x^{\frac{1}{4} - (-\frac{5}{3})} = \frac{1}{3} x^{\frac{1}{4} + \frac{5}{3}} = \frac{1}{3} x^{\frac{3}{12} + \frac{20}{12}} = \frac{1}{3} x^{\frac{23}{12}}$$

d. $(xy^{\frac{5}{2}})^2 \cdot x^{-2} y^{\frac{1}{2}}$

$$x^2 y^5 \cdot x^{-2} y^{\frac{1}{2}}$$

Add exponents:

$$x^0 y^{11/2} = y^{11/2}$$

Unit 3: Quadratics

1) Which form of the quadratic equation shows the minimum or the maximum value of the function without changing the form of the equation

a) Standard form

b) factored form

c) vertex form

2) NC Which of the following equations shows the minimum or the maximum of $h(x)$?

$h(x) = 2(x+3)(x+1)$

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

$h(x) = 2x^2 + 8x + 6$

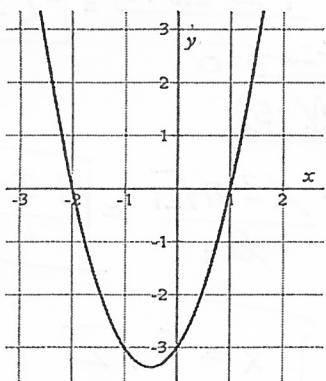
Does $h(x)$ have a maximum or a minimum?

It is a "smile", so it has a minimum.

3) The John Deere Company has found that the revenue from sales of heavy-duty tractors is a function of the unit price P that it charges. The revenue R is $R = -\frac{1}{2}p^2 + 1900p$. What unit price P should be charged to maximize revenue? What is the maximum revenue?

$x = \frac{-b}{2a}$ $x = \frac{-1900}{2(-1/2)}$ $x = 1900$ price Now, plug it in: $-1/2(1900)^2 + 1900(1900) = 1,805,000$ revenue

4) NC The graph below can be represented by which of the following equations:



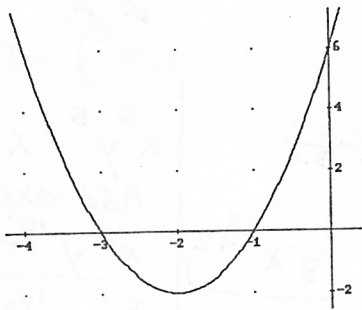
a) $y = (x-2)(x+1)$

b) $y = (x-1)(x+2)$ (X-intercepts are 1 and -2.)

c) $y = (x+1)(x+2)$

d) $y = (x-1)(x-2)$

5) NC Select **ALL** of the functions that can represent the following graph



a) $2x^2 + 4x + 3$

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

c) $2(x+2)^2 - 2$

d) $2(x-3)(x-1)$

e) $2x^2 + 8x + 6 \rightarrow \frac{2(x^2 + 4x + 3)}{2(x+3)(x+1)}$

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

6) NC Simplify each expression. Write your answer in $a + bi$ format.

a. $-3 + 6i - (-5 - 3i) - 8i$
 $-3 + 6i + 5 + 3i - 8i$
 $2 + i$ Combine like terms.

c. $(-2 - i)(4 + i)$ Foil
 $-8 - 2i - 4i - i^2$
 $-8 - 6i - i^2$
 $-7 - 6i$ $-i^2 = -(-1)$
 $-7 - 6i$

b. $-6(4 - 6i)^2$
 $-6(4 - 6i)(4 - 6i)$ Foil
 $-6(16 - 24i - 24i + 36i^2)$
 $-6(16 - 48i - 36)$
 $-6(-20 - 48i)$ Distribute
 $120 + 288i$

d. $(6 - 2i)(11 + 4i)$
 $66 + 24i - 22i - 8i^2$
 $66 + 2i - 8i^2$
 $74 + 2i$

7) NC Solve the following equation using one of the following methods: quadratic formula, factoring, taking square roots, completing the square (don't forget to try GCF first).

a. $\sqrt{(p-6)^2} = 9$
 $p - 6 = \pm 3$
 $p - 6 = 3$ or $p - 6 = -3$
 $p = 9$ or $p = 3$

b. $x^2 - 11x + 19 = 0$
 $x^2 - 11x + 24 = 0$

$x^2 - 11x + 24 = 0$

a=1
b=-11
c=24 > Use the quadratic formula.
 $x = 8$ $x = 3$

c. $n^2 + 8n = 3n$
 $n^2 + 5n = 0$

$n(n+5) = 0$

$n = 0$ or $n = -5$

d. $x^2 + 4x + 6 = 0$ Quad. formula:
 $= \frac{-4 \pm \sqrt{4^2 - 4(1)(6)}}{2(1)}$
 $= \frac{-4 \pm \sqrt{-8}}{2}$

No real solutions. $\rightarrow$ Using complex numbers:
 $-4 \pm 2i\sqrt{2} = -2 \pm i\sqrt{2}$

e. $4x^2 - 2x = 5$ $4x^2 - 2x - 5 = 0$
 $= \frac{-(-2) \pm \sqrt{(-2)^2 - 4(4)(-5)}}{2(4)}$

$= \frac{2 \pm \sqrt{84}}{8} = \frac{2 \pm 2\sqrt{21}}{8} = \frac{1 \pm \sqrt{21}}{4}$

f. $3x^2 + 6 = 12$

$3x^2 = 6$
 $x^2 = 2$
 $x = \pm\sqrt{2}$

8) How many times does each of the following functions intersect the x-axis?

Use your calculator to graph and observe.

$$v = 3x^2 + \frac{2}{3}x - \frac{1}{3}$$

2

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

1

$$y = 2x^2 - \frac{1}{2}x + \frac{3}{2}$$

0

9) Ahmad is jumping up and off of a diving board that is 3 feet above the water. His height above the surface of the water, h , in feet is a function of time, t , in seconds as modeled by the quadratic function $h(t) = -2t^2 + t + 3$.

a) How many seconds does it take for Ahmad to hit the surface of the water?

* Find the x-int, when $y = 0$.

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

$$a = -2, b = 1, c = 3$$

$$\frac{-1 \pm \sqrt{1^2 - 4(-2)(3)}}{2(-2)}$$

$$\frac{-1 \pm 5}{-4}$$

$$\frac{-1 + 5}{-4} = -1$$

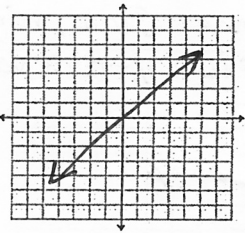
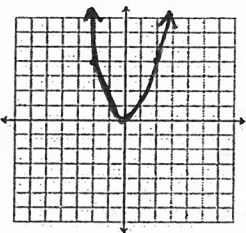
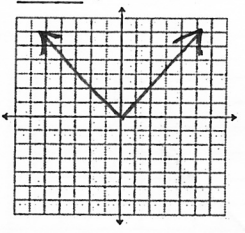
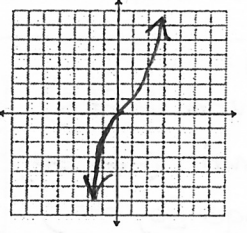
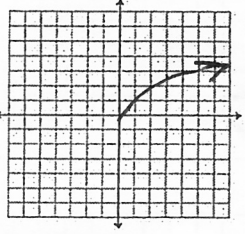
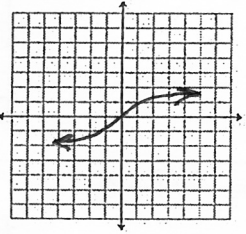
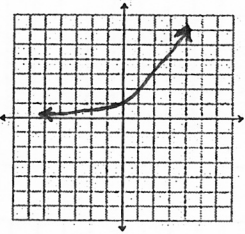
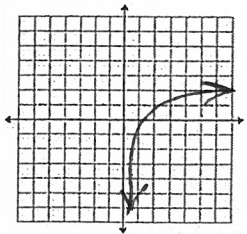
Time cannot be negative.

$$\frac{-1 - 5}{-4} = 1.5$$

b) What is Ahmad's maximum height?

Unit 4: Function Family

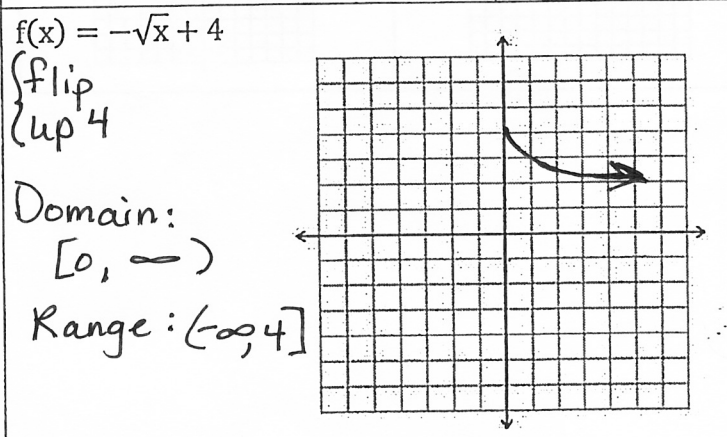
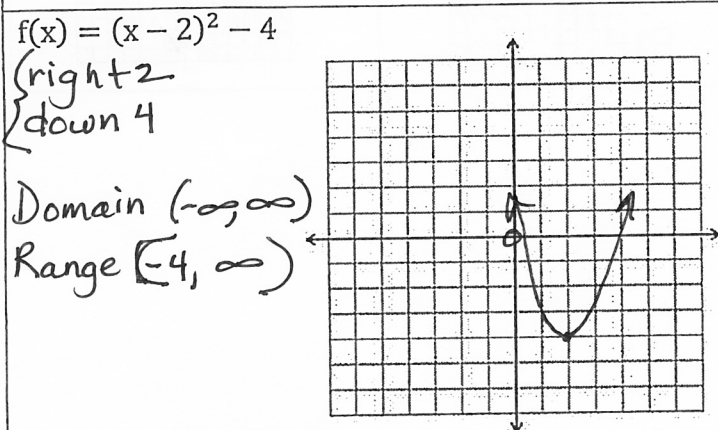
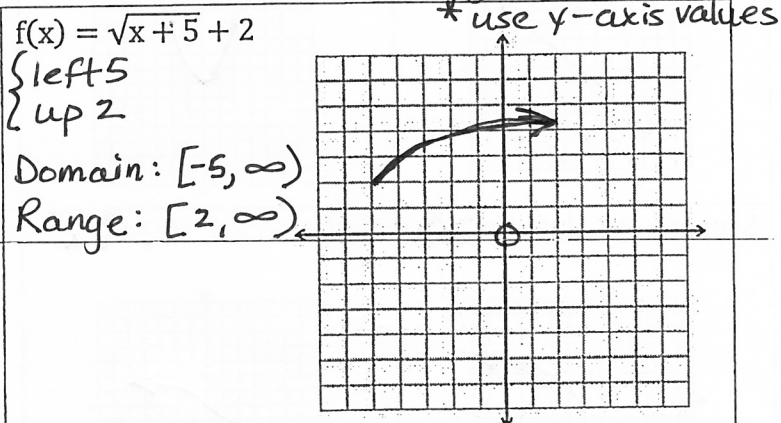
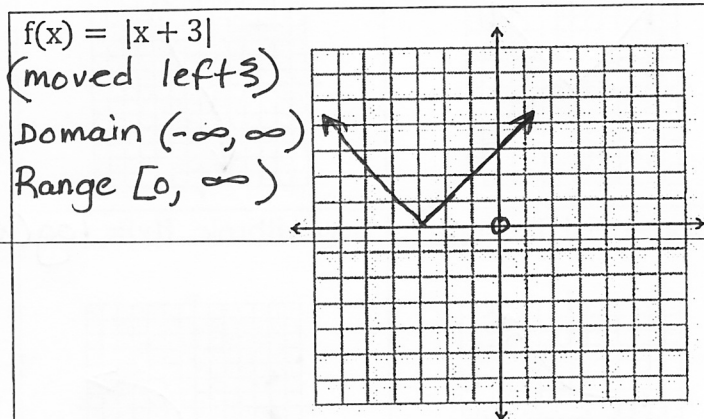
1) NC Given the function name; give the equation, graph, domain, and range.

Linear, $f(x) = \underline{x}$ 	Quadratic, $f(x) = \underline{x^2}$ 	Absolute Value, $f(x) = \underline{ x }$ 	Cubic, $f(x) = \underline{x^3}$ 
Square Root, $f(x) = \underline{\sqrt{x}}$ 	Cube Root, $f(x) = \underline{\sqrt[3]{x}}$ 	Exponential, $f(x) = \underline{2^x}$ 	Logarithmic, $f(x) = \underline{\log(x)}$ 

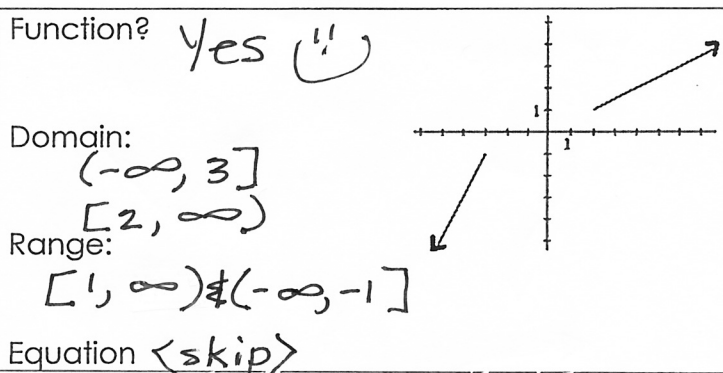
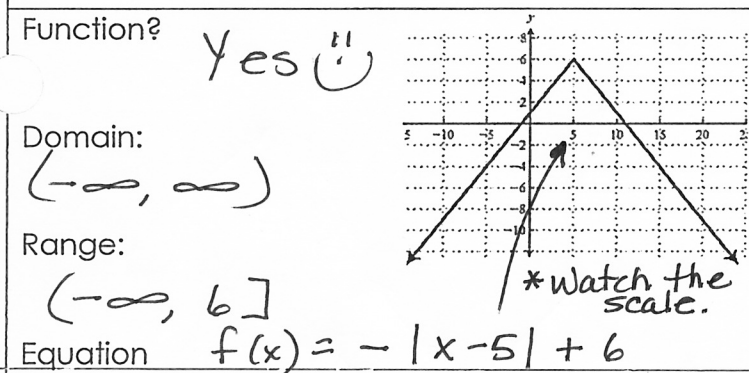
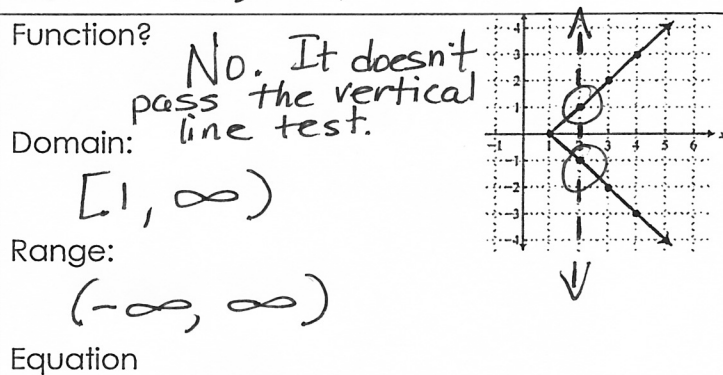
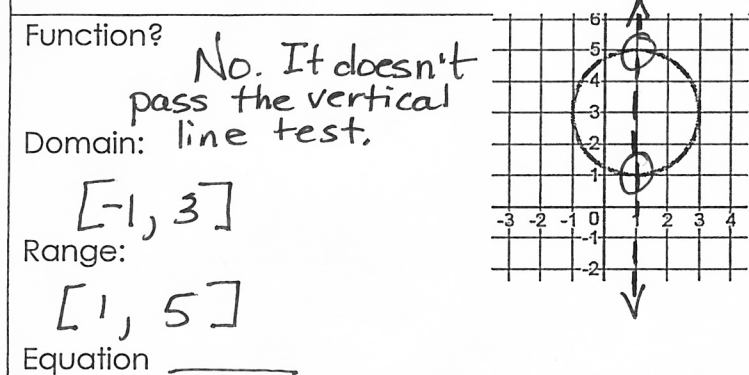
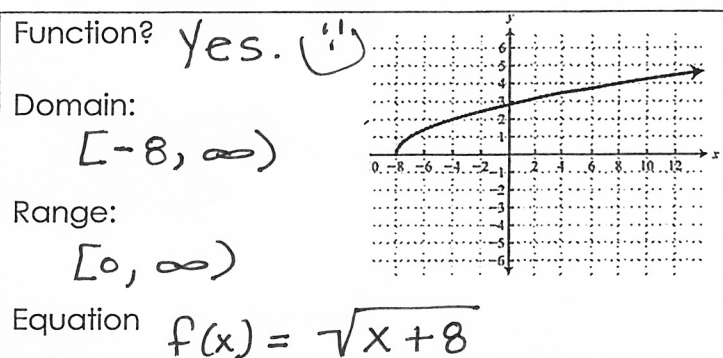
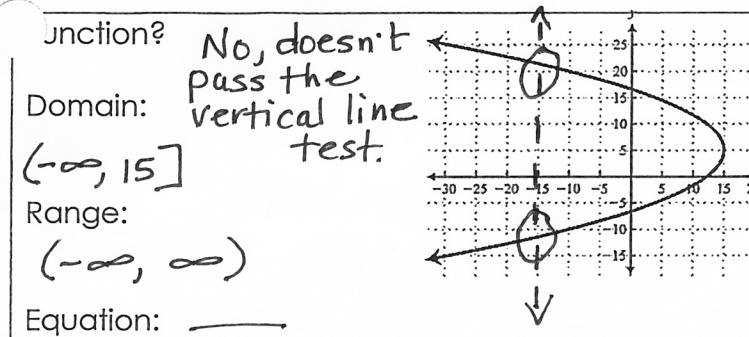
2) For the function, $af(x-b)+c$, complete the table for the effects of each parameter. Then, give an example of each.

$ a > 1$ Effect: vertical stretch "skinnier" Example: $f(x) = 3 x $	$b \geq 0$ Effect: right Example: $f(x) = (x-3)^2$	$c \geq 0$ Effect: up Example: $f(x) = \log x + 7$
$0 < a < 1$ Effect: vertical compression "fatter" Example: $f(x) = \frac{1}{2}x^2$	$b \leq 0$ Effect: left Example: $f(x) = (x+5)^2$	$c \leq 0$ Effect: down Example: $f(x) = \sqrt{x} - 2$
$a < 0$ Effect: Reflection or "flip" Example: $f(x) = -2^x$		

3) NC Graph the following functions. Then, find their domain and range.



4. NC For each graph below, determine if it is a function. Then, find the domain and range. If it is a function, write the equation.



SLOT: RATIONAL EXPRESSIONS

1) Simplify: $\frac{p^2+4p-32}{p^2+3p-28}$

Factor: $\frac{(p+8)(p-4)}{(p+7)(p-4)}$

$\frac{p+8}{p+7}$

Where is p not defined? The denominator cannot be zero. $p \neq -7$ $p \neq 4$

3) Solve $\frac{n+8}{10} = \frac{n-9}{4}$

Cross multiply.

$4(n+8) = 10(n-9)$

Distribute.

$4n + 32 = 10n - 90$

$-6n = -122$

$n \approx 20.3$

2) Simplify: $\frac{x^2-4x-45}{x^2-3x-54}$

Factor: $\frac{(x-9)(x+5)}{(x-9)(x+6)}$

$\frac{x+5}{x+6}$

Where is x not defined? The denominator cannot be zero. $x \neq 9$ $x \neq -6$

4) Solve $\frac{v-5}{v+6} = \frac{4}{9}$

$9(v-5) = 4(v+6)$

$9v - 45 = 4v + 24$

$5v = 69$

$v = 13.8$