

Algebra 3-4 STUDY GUIDE FOR 1st Semester FINAL name _____ pd _____

1) Find the x- and y-intercepts for each function.

a) $y = -10x + 15$

x-int: Set $y=0$

$$0 = -10x + 15$$

$$-15 = -10x$$

$$\frac{-15}{-10} = x = 1.5$$

y-int: Set $x=0$

$$y = -10(0) + 15$$

$$y = 15$$

b) $y = 8x^2 - 200$

x-int:

$$0 = 8x^2 - 200$$

$$200 = 8x^2$$

$$25 = x^2$$

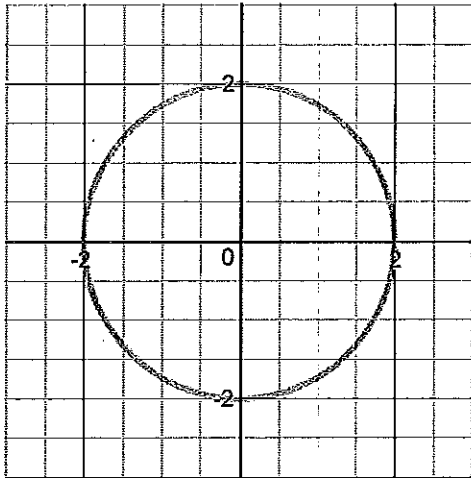
$$\pm 5 = x$$

y-int

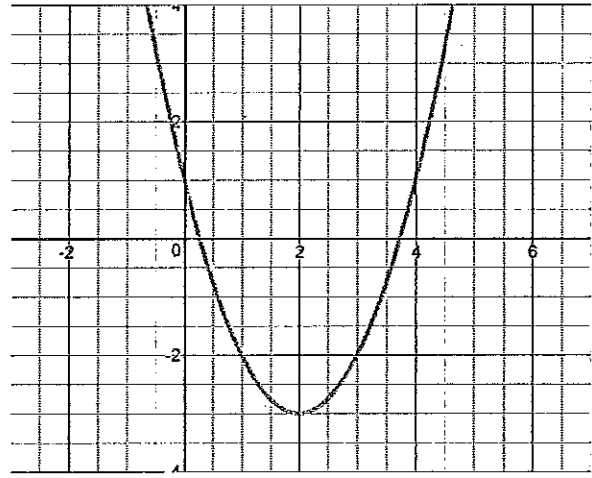
$$y = 8(0)^2 - 200$$

$$y = -200$$

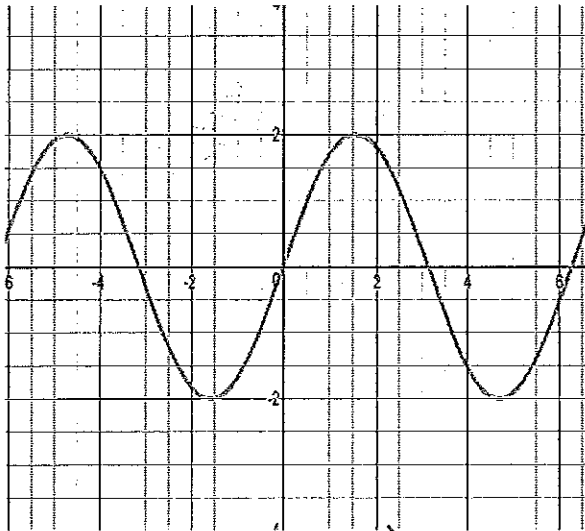
2) State the domain and range of each graph.



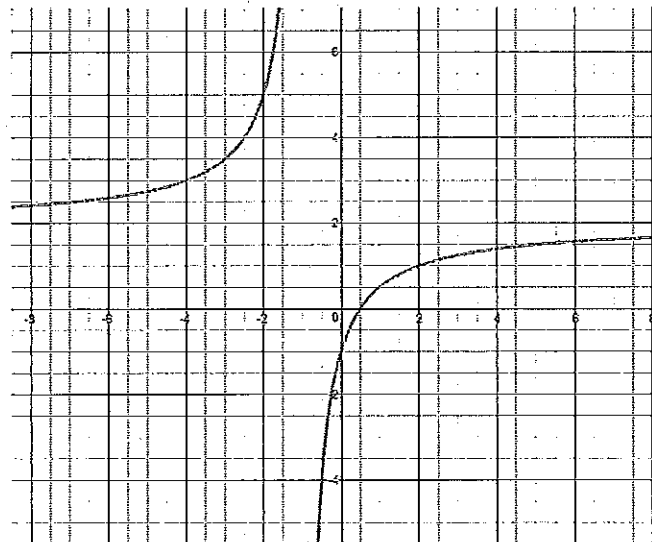
Domain: $[-2, 2]$
Range: $[-2, 2]$



Domain: $(-\infty, \infty)$
Range: $[-3, \infty)$



Domain: $(-\infty, \infty)$
Range: $[-2, 2]$



Domain: $x \neq -1$ OR $(-\infty, -1) \cup (-1, \infty)$
Range: $y \neq 2$ OR $(-\infty, 2) \cup (2, \infty)$

3) Graph the function.

State the x- and y-intercepts. $f(x) = 3\sqrt{x+3} - 4$

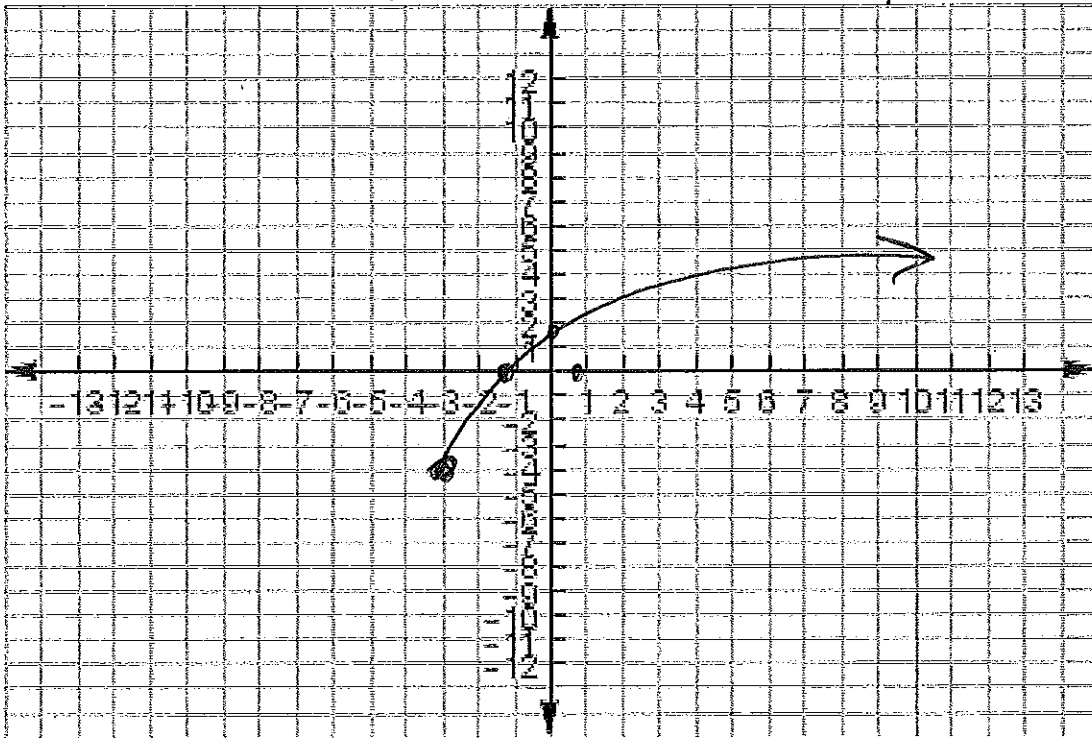
x-int: $0 = 3\sqrt{x+3} - 4$
 $4 = 3\sqrt{x+3}$

$\frac{4}{3} = \sqrt{x+3}$

$\frac{16}{9} = x+3$

$x = \frac{16}{9} - 3 = -\frac{11}{9}$

y-int:
 $y = 3\sqrt{3} - 4$
 $y \approx 1.196$



4) Solve.

a) $4(8x - 1) + 3 = 7 - (x + 2)$

$32x - 4 + 3 = 7 - x - 2$

$32x - 1 = 5 - x$

$33x = 6$

$x = \frac{6}{33}$

b) $2(x + 3)^2 + 5 = 103$

$2(x + 3)^2 = 98$

$(x + 3)^2 = 49$

$x + 3 = \pm 7$

$x + 3 = 7$

$x = 4$

$x + 3 = -7$

$x = -10$

c) $13 = 4\sqrt{x-5} - 1$

$14 = 4\sqrt{x-5}$

$\frac{14}{4} = \sqrt{x-5}$

$\frac{7}{2} = \sqrt{x-5}$

$\frac{49}{4} = x - 5, x = \frac{49}{4} + 5 = \frac{69}{4}$

d) $3(4)^x + 1 = 193$

$\frac{3(4)^x}{3} = \frac{192}{3}$

$4^x = 64$

$4^1 = 4$

$4^2 = 16$

$4^3 = 64$

$x = 3$

5) Given $f(x) = 3x^2 - 108$.

a) Find $f(0)$

$$3(0)^2 - 108 = -108$$

b) Solve for x if $f(x) = 0$

$$\begin{aligned} 3x^2 - 108 &= 0 \\ 3x^2 &= 108 \\ x^2 &= 36 \\ x &= \pm 6 \end{aligned}$$

6) Given $g(x) = \sqrt{x-1} + 3$.

a) Find $g(10)$

$$\begin{aligned} g(10) &= \sqrt{10-1} + 3 \\ &= \sqrt{9} + 3 \\ &= 3 + 3 = 6 \end{aligned}$$

b) Solve for x if $g(x) = 17$.

$$\begin{aligned} 17 &= \sqrt{x-1} + 3 \\ 14 &= \sqrt{x-1} \\ 196 &= x-1 \quad x=197 \end{aligned}$$

7) Write the equation of the line that passes through the points $(-8, 1)$ and $(-24, -1)$.

$$m = \frac{-1 - 1}{-24 - -8} = \frac{-2}{-16} = \frac{1}{8}$$

$$y = \frac{1}{8}x + b$$

$$1 = \frac{1}{8}(-8) + b$$

$$1 = -1 + b$$

$$2 = b$$

$$\boxed{y = \frac{1}{8}x + 2}$$

8) Simplify.

a) $\frac{a^{-3}b^4c^5}{a^6b^7}$

$$\frac{c^5}{a^9b^3}$$

b) $(3g^5h^0)^2$

$$9g^{10}$$

c) $\frac{(-4x^{-3}yw^5)^2}{(6xy^{-4}w)^3}$

$$\frac{16x^{-6}y^2w^{10}}{216x^3y^{-12}w^3}$$

$$\frac{2y^{14}w^7}{27x^9}$$

9) Investigate the function $f(x) = \frac{1}{2}x^3 + 2x - 6$

table:

X					
Y					

Graph:

domain:

$(-\infty, \infty)$

range:

$(-\infty, \infty)$

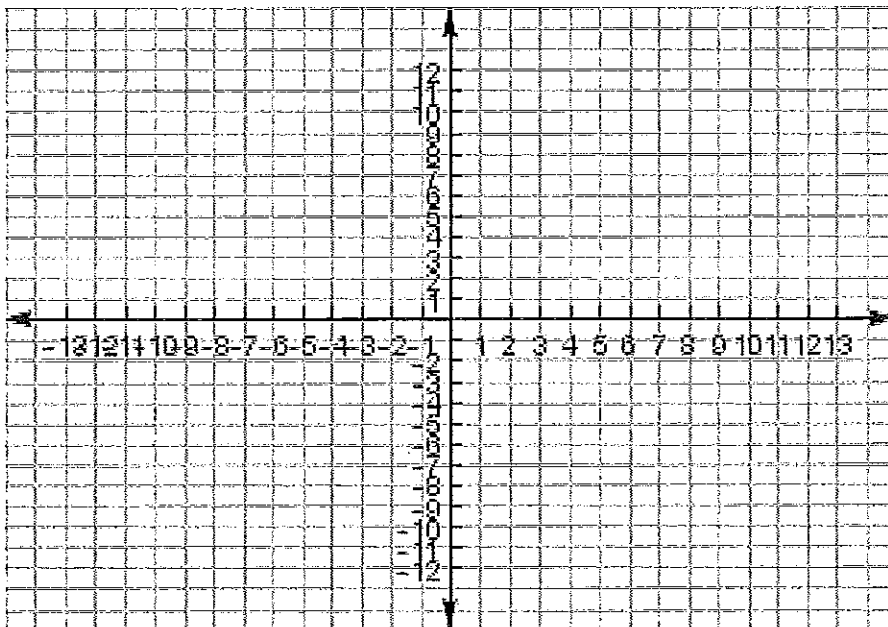
x-intercept(s):

y-intercepts:

$(0, -6)$

asymptotes:

None



10) Use the following sequence to answer a), b) and c): 6, 10, 14, ...

a) Is the sequence arithmetic or geometric? Explain how you know.

Arithmetic \rightarrow adding 4.

b) Give the explicit rule for the sequence.

$$f(x) = 6 + 4(x-1)$$

c) Give the next three terms in the sequence.

18, 22, 26.

11) Use the following sequence to answer a), b) and c): 400, 200, 100, ...

a) Is the sequence arithmetic or geometric? Explain how you know.

Geometric \rightarrow Multiply by $\frac{1}{2}$

b) Give the explicit rule for the sequence.

$$f(x) = 400 \left(\frac{1}{2}\right)^{x-1}$$

c) Give the next three terms in the sequence.

50, 25, 12.5

11) Write an arithmetic **and** a geometric rule for the given two terms. Then find the next three terms using each rule.

10, 15, ...

Arithmetic:

Add 5, $f(x) = 10 + 5(x-1)$, 20, 25, 30

Geometric:

Times 1.5, $f(x) = 10(1.5)^{x-1}$; 22.5, 33.75, 50.625

12) There are 30 deer living in a park. Their population doubles every month.

a) Write an equation to represent their population after 'x' months.

$$y = 30(2)^x$$

b) Is this an example of linear or exponential growth? Why?

Exponential, multiplying pattern.

c) How many deer will there be in 10 months?

$$y = 30(2)^{10} = 30720$$

14) Suzi has \$3000 in an investment. It is depreciating at a rate of 9% per year.

a) Write an equation for the situation. Define your variables.

$y = \$$, $x = \text{years}$
 $y = 3000(0.91)^x$

b) Use your equation to find the value of the investment in ~~2017~~ ²⁰¹⁸

$y = 3000(0.91)^1$
 $y = 2730$

c) When will the investment be worth less than \$1000?

$y =$, 2nd-Table,

x	y
10	1168.2
11	1063.1
12	967.43

15) Write an exponential equation of the curve that passes through (3, 17.28) and (7, 35.8318).

$y = a \cdot b^x$
 $17.28 = a \cdot b^3 \rightarrow a = \frac{17.28}{b^3}$
 $35.8318 = a \cdot b^7$
 $35.8318 = \frac{17.28}{b^3} \cdot b^7$
 $2.0735 = b^4$

16) Find the vertex of the quadratic and write the equation in vertex form. (use the method of finding 'h' from standard form and then finding 'k')

$y = (x + 3)(x - 15)$

$x = -3, x = 15$

$h = \frac{-3 + 15}{2} = \frac{12}{2} = 6$

$k = (6 + 3)(6 - 15)$
 $(9)(-9)$
 -81

Vertex: (6, -81)

$1.199 = b$
 $1.22 = b$
 $a = \frac{17.28}{1.2^3}$
 $a = 10$
 $y = 10(1.2)^x$

18) Multiply and simplify.

a) $(7x - 5)^2$

$(7x - 5)(7x - 5)$

$49x^2 - 35x - 35x + 25$

$49x^2 - 70x + 25$

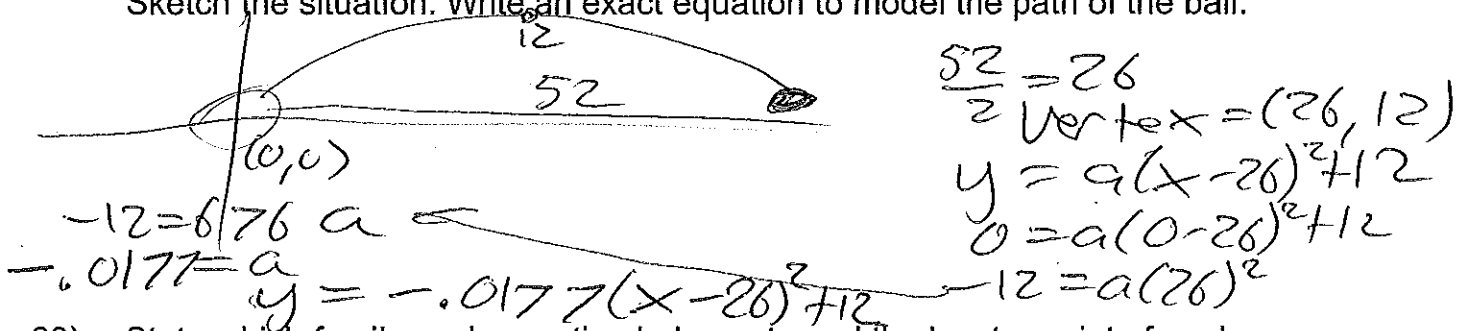
b) $8(x + 1)(4x - 9)$

$8(4x^2 + 4x - 9x - 9)$

$8(4x^2 - 5x - 9)$

$32x^2 - 40x - 72$

- 19) A ball is kicked from the ground and travels in a parabolic path. It travels a total horizontal distance of 52 feet and its maximum height reached is 12 feet. Sketch the situation. Write an exact equation to model the path of the ball.



- 20) State which family each equation belongs to and the locator point of each.

$y = \frac{1}{x-3}$	Linear (3, 0)	$y = (x-5)^2 - 7$	Quadratic/ Parabola (5, -7)	$y = (x+1)^3$	Cubic (-1, 0)
$y = x-8 - 8$	Absolute Value (8, -8)	$y = \sqrt[3]{x+7}$	Cube Root (-7, 0)	$y = \sqrt{x-2}$	Square Root (2, 0)

- 21) Rewrite into vertex form by completing the square.

$$y = x^2 - 12x + 51$$

$$(x - 6)^2 + 15$$

$$\frac{-12}{2} = -6$$

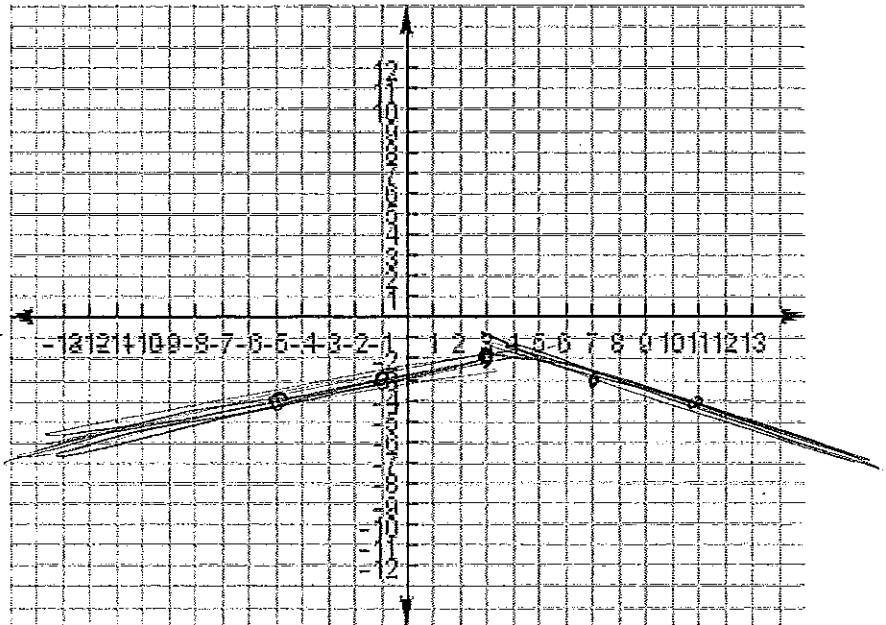
$$(-6)^2 = 36$$
~~$$36$$~~

$$51 - 36 = 15$$

- 22) State the values of 'a', 'h' and 'k' for the given equation. Then describe how each of these values affects this particular graph. Graph the function.

$$y = -\frac{1}{4}|x - 3| - 2$$

$a = -\frac{1}{4}$ Flip over
compress
 $h = 3$ Shift right
3
 $k = -2$ Shift down
2



23) Write an exact equation for a square root function that has a locator point of: (-1, -4) and passes through the point (15, 8).

$$y = a\sqrt{x+1} - 4$$

$$8 = a\sqrt{15+1} - 4$$

$$12 = a\sqrt{16}$$

$$12 = a \cdot 4$$

$$3 = a$$

$$y = 3\sqrt{x+1} - 4$$

24) Solve algebraically.

$$\begin{aligned} 8 \cdot (4x - 5y = 39) &\rightarrow 32x - 40y = 312 \\ 5 \cdot (11x + 8y = -45) &\rightarrow 55x + 40y = -225 \end{aligned}$$

$$87x = 87$$

$$4(1) - 5y = 39 \quad x = 1$$

$$-5y = 35 \quad (1, -7)$$

$$y = -7$$

$$3x - 2(-\frac{1}{2}x - 4) = 0$$

$$3x + x + 8 = 0$$

$$4x + 8 = 0$$

$$x = -2$$

$$y = -\frac{1}{2}(-2) - 4$$

$$y = 1 - 4 = -3$$

$$(-2, -3)$$

25) Solve. $7|x-1| - 8 = 20$

$$7|x-1| = 28$$

$$|x-1| = 4$$

$$x-1 = 4 \quad x-1 = -4$$

$$x = 5 \quad x = -3$$

$$\sqrt[4]{x-2} - 5 = 1 \quad 1-4 = -3$$

$$\sqrt[4]{x-2} = 6$$

$$x-2 = 6^4$$

$$x-2 = 1296$$

$$x = 1298$$

26) Thai Land sells 50 items one busy afternoon. They sell veggie bowls for \$6.00 and desserts for \$7.50. They make a total of \$327. Find how many of each item they sold.

Define your variables. Write a system of equations. Solve it. State your solution.

$x = \text{veggie bowls}$ $y = \text{desserts}$

$$x + y = 50 \rightarrow y = 50 - x$$

$$6x + 7.50y = 327$$

$$6x + 7.50(50 - x) = 327$$

$$6x + 375 - 7.50x = 327$$

$$-1.5x + 375 = 327$$

$$-1.5x = -48$$

$$x = 32$$

$$y = 50 - 32$$

$$y = 18$$