

**I. Radicals & Rational Exponents**

Rewrite in rational exponent form.

a.  $\sqrt[5]{x^2}$

b.  $\frac{1}{\sqrt[3]{y^5}}$

c)  $\sqrt[3]{x}$

d)  $\sqrt[3]{x^7}$

e)  $\frac{\sqrt[3]{x^5}}{\sqrt{x^3}}$

**II. Exponential Word Problems** A savings account has a balance of \$5000.

A) Calculate the account's balance in 5 years if a 5% interest rate is compounded monthly.

B) Calculate the account's balance in 5 years if a 4.5% interest rate is compounded continuously

**III. LEAST COMMON MULTIPLE**

Find the least common multiple for each pair of polynomials.

(i)  $m$  and  $m^2 + m$

(ii)  $n^2$  and  $n^2 - 3n$

(iii)  $3k^2$  and  $4k^2 + 8k$

(iv)  $21p^3$  and  $7p^2(p + 1)$

(v)  $p^2 - 1$  and  $p^2 + p$

(vi)  $x^2 + xy$  and  $y^2 + xy$

**IV. Factor.**

a.  $x^2 - 36$

b.  $27x^3 - 125$

Find the location of any holes (x-value) for each of the following equations.

c.  $y = \frac{x-3}{x^2-9}$

d.  $y = \frac{x}{x^2-2x}$

**V. Parent Functions & Transformations**

State the parent graph. Name the transformations of each function. Name special features such as asymptotes. State Domain &amp; Range for each function.

a.  $y = -\frac{1}{3}(x+4)^2 + 7$

b.  $y = |x+5| - 2$

c.  $y = \frac{1}{x+1} + 10$

d.  $-(x-2)^3 + 1$

e.  $y = \sqrt{x+7}$

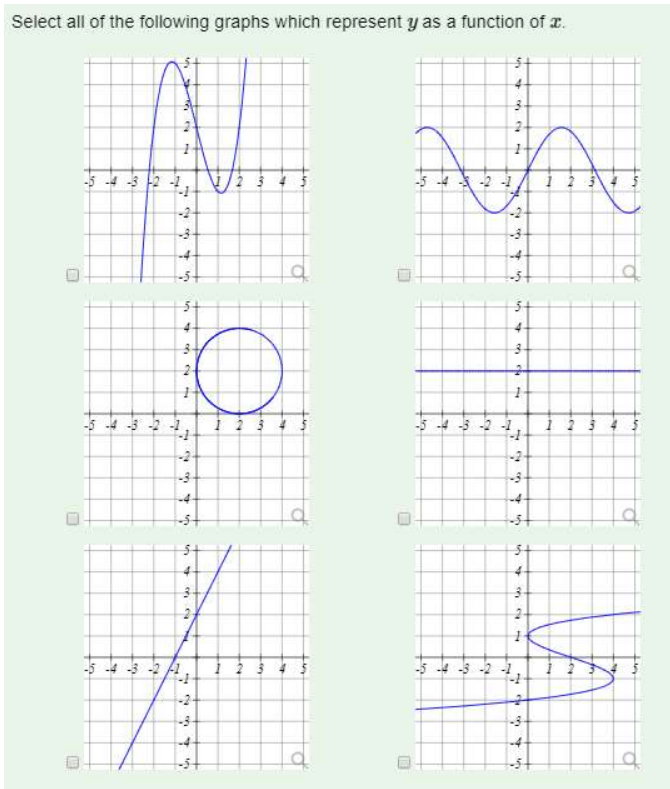
f.  $y = 2^x - 8$

g. Explain how to determine whether a graph is a function.

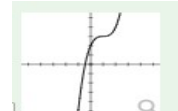
## VI. Choose the sketches which represent functions

Name the parent function of each sketch

a) Select all of the following graphs which represent  $y$  as a function of  $x$ .

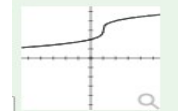


b)



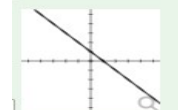
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c)



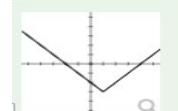
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d)



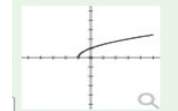
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e)



\_\_\_\_\_

f)



\_\_\_\_\_

g)



\_\_\_\_\_

## VII. INVERSES

1) Write the equation of the inverse. Is the inverse a function?

A.  $y = \frac{x}{6} + 2$

B.  $f(x) = 2x^2 - 1$

2) If  $f(x) = 4x - 3$  then  $f^{-1}(x) = \underline{\hspace{2cm}}$ . (multiple choice)

a)  $3x - 4$

b)  $4y - 3$

c)  $\frac{x-3}{-4}$

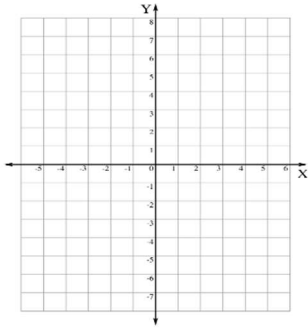
d)  $\frac{x+3}{4}$

e) None of the above

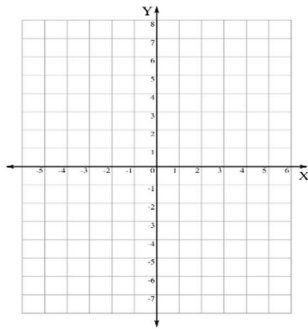
## VIII. GRAPHING & TRANSFORMATIONS

ex: Identify the parent function and sketch the graph. State the domain and range in any notation.

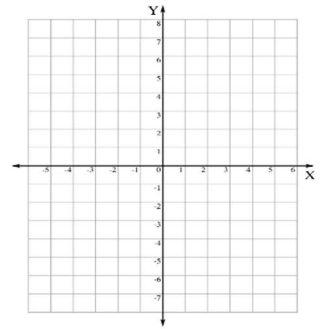
a)  $f(x) = |x + 3| + 2$



b)  $f(x) = \sqrt{x - 4}$



c)  $f(x) = (x - 5)^2 - 3$



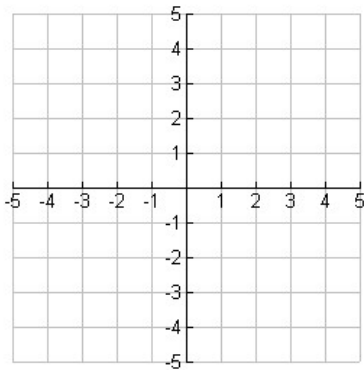
d) State the transformations for the following function:  $y = -3(x + 4)^2 - 1$

e) Describe how the (-2) in  $y = -2x^2$  changed the graph of  $y = x^2$ .

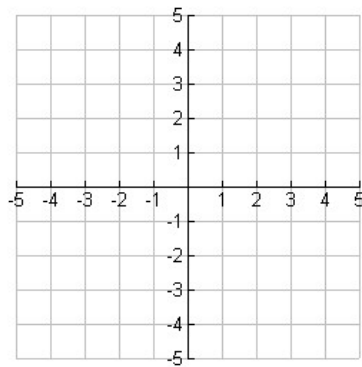
f) Then describe any new transformation which appears when  $y = -2x^2$  changes to  $y = -2(x + 1)^2$

## IX. GRAPH each function.

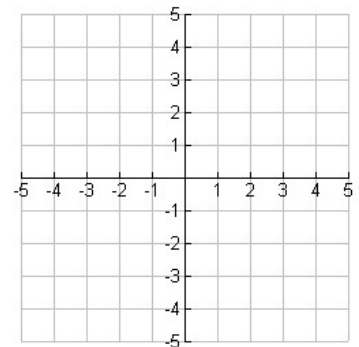
a)  $3y - x + 4 = 0$



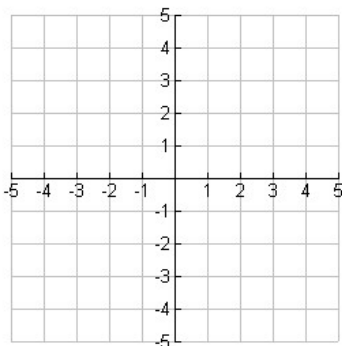
b)  $f(x) = (x + 1)^2 - 4$



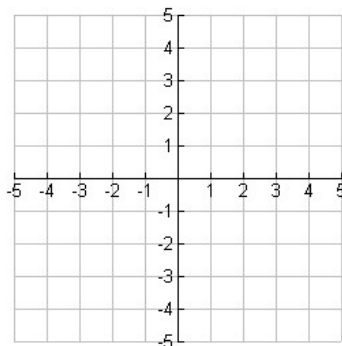
c)  $y = |x - 2|$



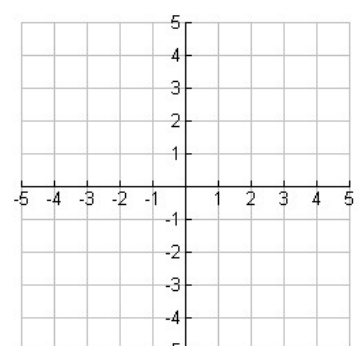
d)  $f(x) = \frac{1}{x + 3}$



e)  $h(x) = \frac{-x + 1}{x + 1}$



f)  $y = -x(x + 2)(x - 2)$



## X. LOGS (converting between forms)

Rewrite each logarithmic equation as an exponential equation and each exponential equations as a logarithmic equation (change forms).

a.  $y = \log_4 x$

b.  $4^x = 80$

c.  $5^{2x} = \frac{1}{125}$

d.  $-4 = \log_x \left( \frac{1}{16} \right)$

## XI. Logs - SIMPLIFY / EVALUATE/Expand

Simplify:

25.  $\log_6 6^2 =$  \_\_\_\_\_

26.  $7^{\log_7 4} =$  \_\_\_\_\_

Evaluate each expression. (multiple choice)

27)  $\log_7 343$

- A) 49      B)  $\frac{1}{3}$   
C) 3        D) -3

28)  $\log_2 8$

- A)  $\frac{1}{3}$       B) 4  
C) 3        D) -3

29)  $\log_5 25$

- A) 2        B)  $-\frac{1}{2}$   
C) 5        D)  $\frac{1}{2}$

30)  $\log_6 \frac{1}{36}$

- A) 2        B)  $-\frac{1}{2}$   
C) -2      D)  $\frac{1}{216}$

Expand each logarithm. (multiple choice)

31)  $\log_5 \frac{u^3}{v^2}$

- A)  $\frac{\log_5 u}{3} + \frac{\log_5 v}{3} + \frac{\log_5 w}{3}$   
B)  $3\log_5 w + \frac{\log_5 u}{3}$   
C)  $3\log_5 u - 2\log_5 v$   
D)  $3\log_5 u + 2\log_5 v$

32)  $\log_8 (a^6 b^5)$

- A)  $\log_8 a + \log_8 b + 6\log_8 c$   
B)  $5\log_8 a - 30\log_8 b$   
C)  $6\log_8 a + 5\log_8 b$   
D)  $\frac{\log_8 a}{3} + \frac{\log_8 b}{3} + \frac{\log_8 c}{3}$

(NOT multiple choice)

33.  $\log \left( \frac{xy^3}{100} \right)$

Evaluate.

34.  $\log_9 \frac{1}{27}$

35.  $\ln \sqrt{e}$

36.  $\log_{16} 4$

SOLVE.

37.  $3^x - 1 = 15$

38.  $2\log_5 x = 4$

## XII. Exponential & Logarithmic Equations

Solve.

a.  $4 = \log_5 x$       b.  $81 = 9^x$       c.  $7^x = \frac{1}{49}$       d.  $\log_5\left(\frac{1}{125}\right) = x$

e.  $x^{\frac{2}{3}} = 4$       f.  $x^{\frac{1}{2}} = \frac{1}{9}$       g.  $27^x = 9$       h.  $16^{x+1} = 8$       i.  $3^{5x} = 9^{x-1}$

j.  $\log_4\left(\frac{1}{16}\right) = x$       k.  $\log_5 x = -3$       l.  $6 \log_4 2 = x$       m.  $\log_8 4 + \log_8 x = 2$

n.  $\log 12x - \log(x+4) = 1$       o.  $\log_5(x+6) + \log_5 2 = \log_5 40$

p.  $\log_5 3 + \log_5 x = 2 \log_5 6$       q.  $\log_6 x - 2 \log_6 3 = \log_6 5$

r. Solve to 2 decimal places:  $438 = 200e^{0.25x}$  (multiple choice)  
a) 4.59      b) 8.76      c) .123      d) 3.14      e) None of the above

## XIII. Tell whether the function represents *exponential growth* or *exponential decay*. (Write the word)

a. $f(x) = \frac{5}{3}\left(\frac{4}{5}\right)^x$	b. $f(x) = \frac{3}{5}\left(\frac{5}{4}\right)^x$	c. $f(x) = 5(2)^x$
d. How can you tell whether it is growth or decay?		

#### XIV. Logs - Transformations

State the transformations of each function below.

a.  $y = \log(x + 2)$

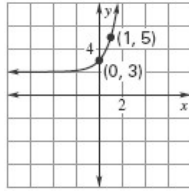
b.  $y = -5 + \log x$

c.  $y = 5 + 3\log(x - 7)$

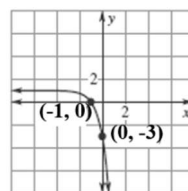
#### XV. GRAPHS - Match the function with its graph. (EXPONENTIAL)

1.  $f(x) = \left(\frac{4}{3}\right)^x - 3$

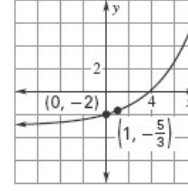
A



B



C



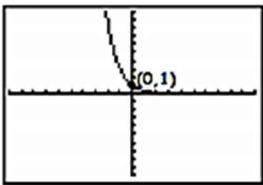
2.  $f(x) = 3^x + 2$

3.  $f(x) = -4^{x+1} + 1$

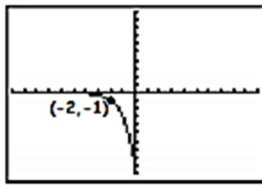
#### Match the function with its graph. (Exponential & LOGARITHMIC)

4. Select the graph for the exponential function  $f(x) = 3^{x-2} + 1$

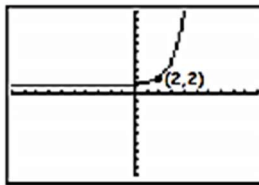
A.



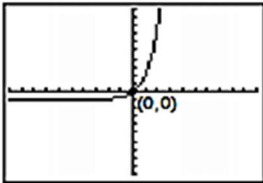
B.



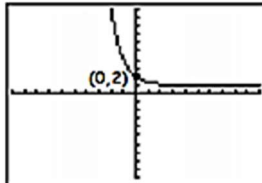
C.



D.



E.



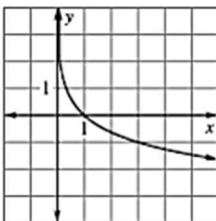
5. Match the function with its graph.

1.  $f(x) = \log_2 x$

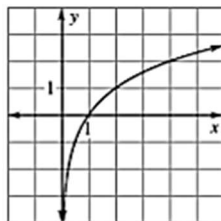
2.  $f(x) = \log_5 x$

3.  $f(x) = \log_{1/3} x$

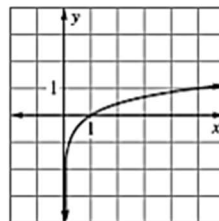
A.



B.



C.



## XVI. LOGS/Exponential

Write as a single log

29)  $\log 6 + \log 3$

30)  $\frac{\log_4 7}{\log_4 3}$

31)  $\log_2 15 - \log_2 5$

32)  $\frac{\log_8 10}{\log_8 2}$

Condense each expression to a single logarithm.

(multiple choice)

33)  $2\log_4 x + 6\log_4 y$

A)  $\log_4 \sqrt{zyx}$

B)  $\log_4 \frac{x^6}{y^{12}}$

C)  $\log_4 (y^6 x^2)$

D)  $\log_4 (z^2 \sqrt{x})$

34)  $4\log_8 10 - 2\log_8 3$

A)  $\log_8 \sqrt[3]{330}$

B)  $\log_8 \frac{10^4}{3^2}$

C)  $\log_8 (3^2 \cdot 10^4)$

D)  $\log_8 (11\sqrt[3]{30})$

(multiple choice)

Solve each equation.

35)  $\log_8 x = 4$

A) {4096}

B) {512}

C) {1}

D) {12}

36)  $\log_6 8v = 0$

A)  $\left\{\frac{1}{8}\right\}$

B)  $\left\{-\frac{17}{6}\right\}$

C) {27}

D) {-3}

37)  $-6 + 2\log_9 (p+7) = -10$

A)  $\left\{\frac{625}{2}\right\}$

B)  $\left\{-\frac{1}{288}\right\}$

C)  $\left\{-\frac{566}{81}\right\}$

D) {146}

37b)  $\log_4 (x+1) = 2 + \log_4 (3x-2)$ .

a) {1}

b)  $\left\{\frac{33}{47}\right\}$

c)  $\left\{\frac{1}{2}\right\}$

d) {0}

e) None of the above

Solve each equation. Round your answers to the nearest ten-thousandth. (multiple choice)

38)  $8^b = 79$

A) 1.8976

B) 4.3694

C) 2.1013

D) No solution.

39)  $14^{-4k} = 22.4$

A) -0.2945

B) No solution.

C) -0.7773

D) -0.3376

## XVII. Rational Expressions/Equations

Solve.

$$7) \frac{2x}{7} + \frac{1}{3} = 6$$

$$8) \frac{1}{x} + \frac{1}{x+3} = 4$$

$$9) \frac{x}{x+2} = \frac{-3}{x+4}$$

$$10) \frac{x-1}{11} - \frac{7}{66} = \frac{1}{6}$$

$$11) \frac{x^2 + x - 6}{x^2 - 4} \div \frac{x^2 + 4x + 3}{4x + 8}$$

$$12) \frac{5}{x-4} - \frac{2x}{x^2 - 3x - 4}$$

Solve. (multiple choice)

$$13) \frac{3m-9}{3} \cdot \frac{20}{m^2 - 11m + 24}$$

A)  $m - 2$

B)  $\frac{m+8}{6m^2}$

C)  $\frac{20}{m-8}$

D)  $\frac{m-8}{(m+5)(m-4)}$

(multiple choice)

$$14) \frac{p^2 - 5p - 24}{8p - 64} \cdot \frac{p+3}{4p+12}$$

A)  $\frac{p+3}{32}$

B)  $49p$

C)  $\frac{7}{p+3}$

D)  $\frac{p-8}{p+4}$

(multiple choice)

$$15) \frac{8x-72}{9x^3 - 72x^2} \div \frac{x-9}{9x^3 - 72x^2}$$

A)  $\frac{x-4}{30x}$

B)  $8$

C)  $x+4$

D)  $\frac{2}{x-8}$

### Rational Equation – DOMAIN

16) (multiple choice) Find the domain of  $y = \frac{(x-5)(x^2 + x - 20)}{x^2 + 4x - 5}$

a) All real numbers

b)  $\{x \mid x \neq 1\}$

c)  $\{x \mid x \neq 1, 5\}$

d)  $\{x \mid -5 < x < 1\}$

e) None of the above

### Rational Function – ASYMPTOTES, DOMAIN & RANGE

17) (multiple choice) Determine the asymptotes of the graph of  $f(x) = \frac{x+1}{(x-1)^2}$

a) VA:  $x=1$ ; HA:  $y=1$

b) VA:  $x=1$ ; HA:  $y=0$

c) VA:  $x=-1$ ; HA:  $y=1$

d) VA:  $x=-1$ ; HA:  $y=0$

e) None of the above

For each Rational Function, fill in the following information.

	Horizontal Asymptote	Vertical Asymptote	Domain	Range
18) $f(x) = \frac{5}{2x-6} + 2$				
19) $f(x) = \frac{8x}{x+5}$				



### XVIII. POLYNOMIALS - Operations

20) If  $f(x) = x^2$  and  $g(x) = x + 2$ , find  $(f + g)(3)$ . (multiple choice)

- a) 45
- b) 3
- c) 14
- d) 11
- e) None of the above

21) THEN find  $(f-g)(x)$

22) THEN find  $(fg)(x)$

23) THEN find  $(g(f(x)))$  or  $(g \circ f)(x)$

### POLYNOMIALS - Identification

24) State whether each of the following is a polynomial function.

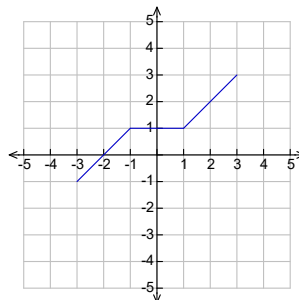
If it is, give the degree. If it not, explain why not.

a.  $\frac{1}{8}x^7 + 4.23x^6 - x^4 - \pi x^2 - 0.1$

b.  $45x^3 - 0.75x^2 - \frac{3}{100}x + \frac{5}{x} + 15$

### XIX. Graphs and Characteristics

Use the graph of  $f(x)$  to find the following:



25)  $f(3)$

26) Interval where  $f(x)$  is increasing

27) Interval where  $f(x)$  is decreasing

## XX. POLYNOMIALS

50) State the x-intercepts and multiplicity of each. State if the graph will bounce back or cross at each x-intercept.

a.  $f(x) = -x(x+8)(x+1)$

b.  $y = x(x+4)(x^2-1)(x-4)$

51) State the least possible degree and number of turning points.

a.  $f(x) = -x(x+8)(x+1)$

b.  $y = x(x+4)(x^2-1)(x-4)$

Describe the end behavior of each function. (multiple choice)

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

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

A)  $x \rightarrow -\infty, f(x) \rightarrow +\infty$

$x \rightarrow +\infty, f(x) \rightarrow +\infty$

B)  $x \rightarrow -\infty, f(x) \rightarrow +\infty$

$x \rightarrow +\infty, f(x) \rightarrow -\infty$

C)  $x \rightarrow -\infty, f(x) \rightarrow -\infty$

$x \rightarrow +\infty, f(x) \rightarrow -\infty$

D)  $x \rightarrow -\infty, f(x) \rightarrow -\infty$

$x \rightarrow +\infty, f(x) \rightarrow +\infty$

A)  $x \rightarrow -\infty, f(x) \rightarrow +\infty$

$x \rightarrow +\infty, f(x) \rightarrow -\infty$

B)  $x \rightarrow -\infty, f(x) \rightarrow +\infty$

$x \rightarrow +\infty, f(x) \rightarrow +\infty$

C)  $x \rightarrow -\infty, f(x) \rightarrow -\infty$

$x \rightarrow +\infty, f(x) \rightarrow +\infty$

D)  $x \rightarrow -\infty, f(x) \rightarrow -\infty$

$x \rightarrow +\infty, f(x) \rightarrow -\infty$

Describe the end behavior for both functions graphed.

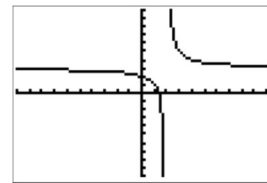
54)



$f(x) = 2^x - 3$

As  $x \rightarrow +\infty, f(x) \rightarrow$  \_\_\_\_\_ As  $x \rightarrow -\infty, f(x) \rightarrow$  \_\_\_\_\_

55)



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

As  $x \rightarrow +\infty, f(x) \rightarrow$  \_\_\_\_\_ As  $x \rightarrow -\infty, f(x) \rightarrow$  \_\_\_\_\_

56) What is the set of possible rational zeros for  $p(x) = 2x^4 - 9x^3 + 4x^2 + 21x - 18$ ? (multiple choice)

a)  $\left\{ \pm 1, \pm 2, \pm 3, \pm 6, \pm 9, \pm 18, \pm \frac{1}{2}, \pm \frac{3}{2}, \pm \frac{9}{2} \right\}$

d)  $\{ \pm 1, \pm 2 \}$

b)  $\left\{ \pm 1, \pm 2, \pm \frac{1}{2}, \pm \frac{1}{3}, \pm \frac{1}{6}, \pm \frac{1}{9}, \pm \frac{2}{9}, \pm \frac{1}{18} \right\}$

e) None of the above

c)  $\{ \pm 1, \pm 2, \pm 3, \pm 6, \pm 9, \pm 18 \}$

57) Consider  $f(x) = x^3 + x^2 - 8x - 8$

a) State the possible rational zeros

b) Find the actual zeros.

c) What is  $f(-1)$ ? \_\_\_\_\_

d) What is  $f(2)$ ? \_\_\_\_\_

58) CONSIDER  $f(x) = x^4 + 15x^2 - 16$

List the Possible Zeros:

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Test possible zeros using synthetic division until you get the function down to a quadratic.

Find all zero's of the polynomial function.

All zeros found: \_\_\_\_\_

59) CONSIDER  $f(x) = x^4 + x^3 + 2x^2 + 4x - 8$

List the Possible Zeros

---

Test possible zeros using synthetic division until you get the function down to a quadratic:

Find all zero's of the polynomial function.

All zeros found: \_\_\_\_\_

### XXI. POLYNOMIAL Graphs and Characteristics

60) From the graph provided identify the following...

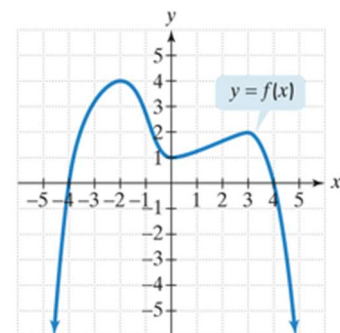
Least Possible degree: \_\_\_\_\_ Even or Odd?

Positive or Negative Leading coefficient (a): \_\_\_\_\_

Name the zeros: \_\_\_\_\_

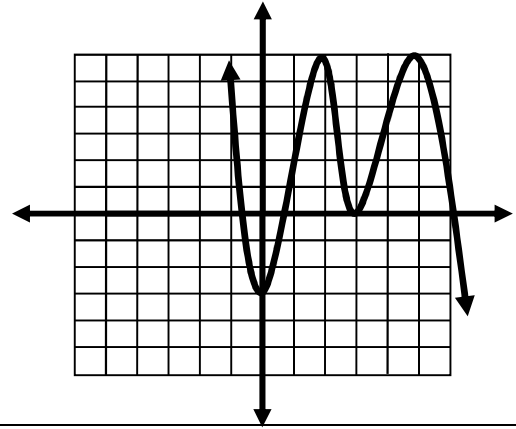
Properly name an increasing interval: \_\_\_\_\_

Properly name a decreasing interval: \_\_\_\_\_



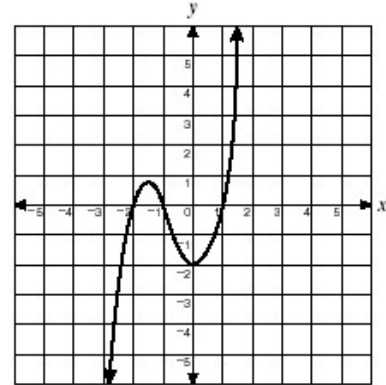
61) Use the graph to the right to answer the following:

- . End Behavior  $x \rightarrow +\infty, f(x) \rightarrow$  \_\_\_\_\_
- $x \rightarrow -\infty, f(x) \rightarrow$  \_\_\_\_\_
- . # Turning Points: \_\_\_\_\_
- . Least Possible Degree of polynomial: \_\_\_\_\_
- Even or Odd? \_\_\_\_\_



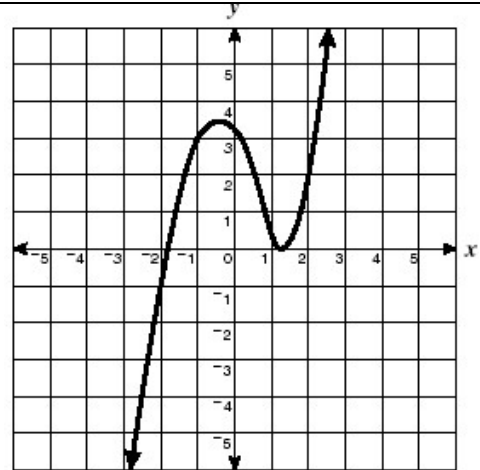
62) Using the graph of the polynomial shown below,

- . Name all the roots that you can see: \_\_\_\_\_
- . End Behavior:  $x \rightarrow +\infty, f(x) \rightarrow$  \_\_\_\_\_
- $x \rightarrow -\infty, f(x) \rightarrow$  \_\_\_\_\_
- . # Turning Points: \_\_\_\_\_
- . Least Possible Degree of polynomial: \_\_\_\_\_
- Even or Odd? \_\_\_\_\_



63) The graph of the function to the right has an even multiplicity for the root found

between  $x =$  \_\_\_\_\_ and  $x =$  \_\_\_\_\_  
 At this root, the graph \_\_\_\_\_  
 the x-axis. (bounces or crosses)



# ANSWERS Alg2 Final Exam Review:

## I. Radicals & Rational Exponents

a)  $x^{\frac{2}{5}}$    b)  $y^{-\frac{5}{3}}$    c)  $x^{\frac{1}{3}}$    d)  $x^{\frac{7}{3}}$    e)  $\frac{x^{\frac{5}{3}}}{x^2} = x^{\frac{1}{6}}$

## II. Exponential Word Problems

a) \$6,416.79   P=5,000   r=0.05   t=5   n=12  
 b) \$6,261.61   P=5,000   r=0.045   t=5

## III. LEAST COMMON MULTIPLE

i)  $m(m+1)$    ii)  $n^2(n-3)$    iii)  $12k^2(k+2)$   
 iv)  $21p^3(p+1)$    v)  $p(p+1)(p-1)$    vi)  $xy(x+y)$

## IV. Factor.

a)  $(x+6)(x-6)$   
 b)  $(3x-5)(9x^2 + 15x + 25)$

## V. Parent Functions & Transformations

a)  $y=x^2$ ; Reflection over x-axis, Vertical Compression by a factor of 1/3  
 Horizontal Shift Left 4 units, Vertical Shift Up 7 units  
 D:  $\{x|x \in \mathbb{R}\}$   
 R:  $\{y|y \leq 7\}$

b)  $y=|x|$ ; Horizontal Shift Left 5 units, Vertical Shift Down 2 units  
 D:  $\{x|x \in \mathbb{R}\}$   
 R:  $\{y|y \geq -2\}$

c)  $y=\frac{1}{x}$ ; Horizontal Shift Left 1 unit, Vertical Shift Up 10 units  
 D:  $\{x|x \neq -1\}$   
 R:  $\{y|y \neq 10\}$

d)  $y=x^3$ ; Reflection over x-axis, Horizontal Shift Right 2 units, Vertical Shift Up 1 unit  
 D:  $(-\infty, +\infty)$   
 R:  $(-\infty, +\infty)$

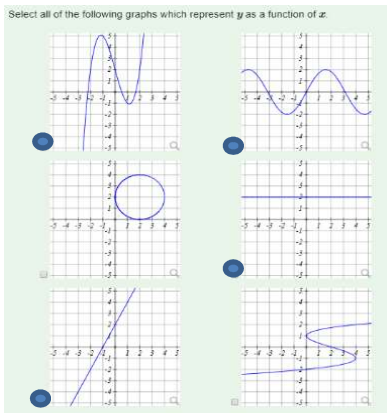
e)  $y=\sqrt{x}$ ; Horizontal Shift Left 7 units,  
 D:  $[-7, +\infty)$   
 R:  $[0, +\infty)$

f)  $y=2^x$ ; Vertical Shift Down 8 units,  
 D:  $(-\infty, +\infty)$   
 R:  $(-8, +\infty)$

g) A graph is a function if it passes the Horizontal Line Test.

## VI. Choose the sketches which represent functions

a)



- b) Cubic
- c) Cube Root
- d) Identity
- e) Absolute Value
- f) Square Root
- g) Rational (Reciprocal)

## VII. INVERSES

**1A)**  $y^{-1}(x) = 6x - 12$

**Yes, Inverse is a function**

**1B)**  $f^{-1}(x) = \pm\sqrt{\frac{x+1}{2}}$

**NO, Inverse is NOT a function**

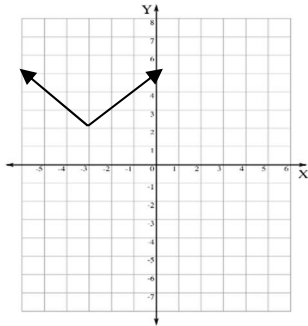
**2) d**

## VIII. GRAPHING & TRANSFORMATIONS

a) Parent:  $f(x) = |x|$

**D:**  $\{x|x \in \mathbb{R}\}$

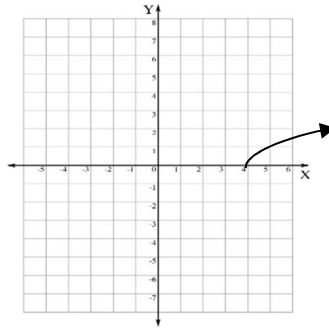
**R:**  $[2, +\infty)$



b) Parent  $f(x) = \sqrt{x}$

**D:**  $[4, +\infty)$

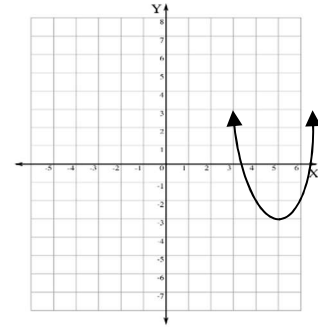
**R:**  $\{y|y \geq 0\}$



c) Parent  $f(x) = (x)^2$

**D:**  $[-\infty, +\infty)$

**R:**  $\{y|y \geq -3\}$



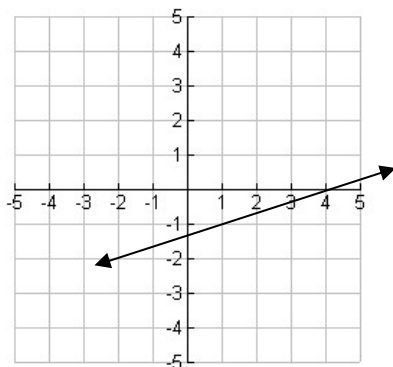
d) **Reflection over x-axis, Vertical Stretch by a factor of 3, Horizontal Shift Left 4 units, Vertical Shift Down 1 unit**

e) Parent was reflected over the x-axis and vertically stretched by a factor of 2

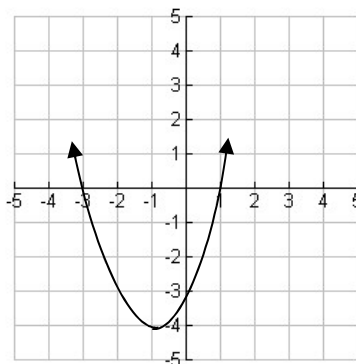
f) The new transformation on the parent was a horizontal shift left 1 unit.

## IX. GRAPH each function.

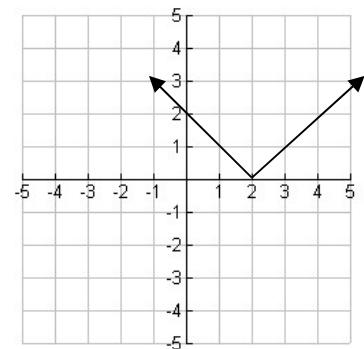
g)  $3y - x + 4 = 0$

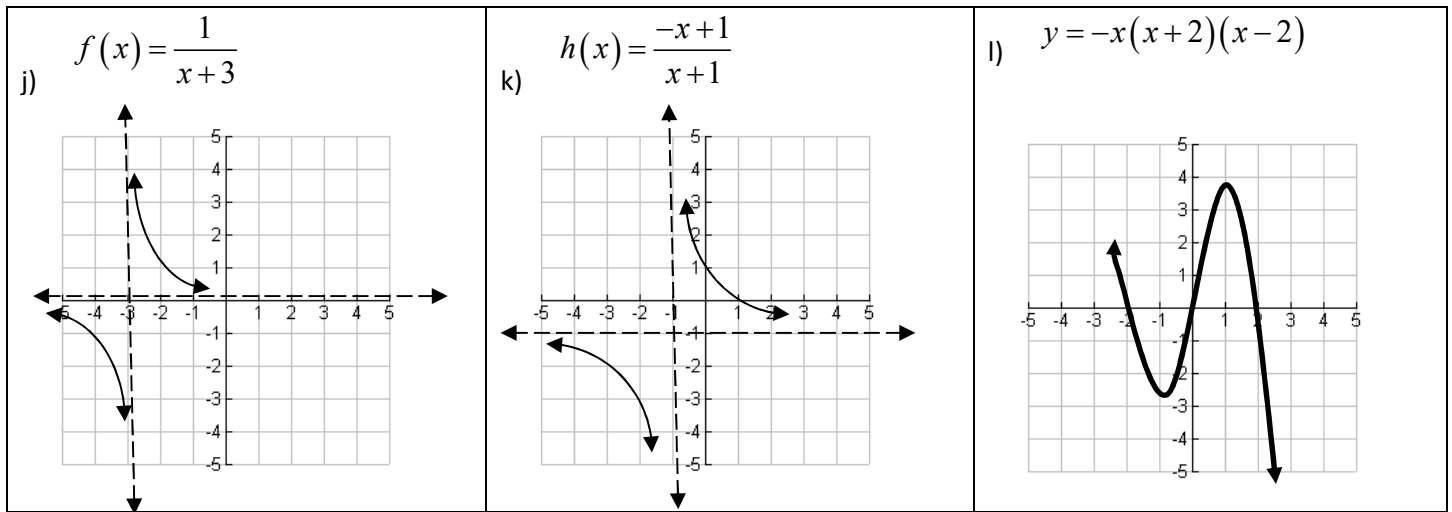


h)  $f(x) = (x+1)^2 - 4$



i)  $y = |x - 2|$





**X. LOGS (converting between forms)**

- a.  $x = 4^y$       b.  $\log_4 80$       c.  $5^{2x} = \frac{1}{125} \rightarrow \log_5 \frac{1}{125} = 2x$       1      d.  $x^{-4} = \frac{1}{16}$   
 (missing x in exponent)

**XI. Logs - SIMPLIFY / EVALUATE/Expand**

25. 2      26. 4      27. C      28. C      29. A      30. C  
 31. C      32. C      33.  $\log x + 3 \log y - 2$       34.  $-\frac{3}{2}$       35.  $\frac{1}{2}$   
 36.  $\frac{1}{2}$       37.  $x \approx 2.5237$       38.  $x = 25$

**XII. Exponential & Logarithmic Equations Solve.**

- a.  $x = 625$       b.  $x = 2$       c.  $x = -2$       d.  $x = -3$       e.  $x = \pm 8$       f.  $x = \frac{1}{81}$       g.  $x = \frac{2}{3}$       h.  $x = -\frac{1}{4}$   
 i.  $x = -\frac{2}{3}$       j.  $x = \frac{2}{3}$       k.  $x = \frac{1}{125}$       l.  $x = 3$       m.  $x = 16$       n.  $x = 20$       o.  $x = 14$       p.  $x = 12$   
 q.  $x = 45$       r. d

**XIII. Tell whether the function represents exponential growth or exponential decay. (Write the word)**

- a. Decay  $b = \frac{4}{5}$       b. Growth  $b = \frac{5}{4}$       c. Growth  $b = 2$   
 d. An exponential function represents growth, ( $b > 1$ ), when the base is greater than 1.  
 An exponential function represents decay, ( $0 < b < 1$ ), when the base is greater than zero and less than 1.

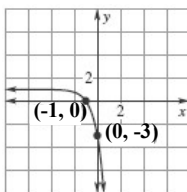
**XIV. Logs - Transformations**

- a. Horizontal Shift Left 2 units      b. Vertical Shift Down 5 units      c. Vertical Stretch by a factor of 3, H.S. Right 7, V.S. Up 5

**XV. GRAPHS - Match the function with its graph. (EXPONENTIAL)**

1.  $f(x) = \left(\frac{4}{3}\right)^x - 3$       C  
 2.  $f(x) = 3^x + 2$       A  
 3.  $f(x) = -4^{x+1} + 1$       B

CORRECTION



**Match the function with its graph. (Exponential & LOGARITHMIC)**

4. C      5. 1) B      2) C      3) A

**XVI. LOGS/Exponential**

- 29)  $\log 18$       30)  $\log_3 7$       31)  $\log_2 3$       32)  $\log_2 10$   
 33) C    34) B    35) A    36) A    37) C    37b) B    38) C    39) A

**XVII. Rational Expressions/Equations**

Solve.

- 7)  $x \approx 19.8\bar{3}$       8)  $x = \frac{-5 \pm \sqrt{37}}{4}; x \neq 0, -3$       9)  $x = -1; x \neq -2, -4$       10)  $x = 4$   
 11)  $x = \frac{4}{x+1}; x \neq -3, -1, \pm 2$       12)  $x = \frac{3x+5}{(x-4)(x+1)}; x \neq -1, 4$       13) C      14) A      15) B

**Rational Equation – DOMAIN**

- 16) e) None of the above (choice c is missing negative on 5)

**Rational Function – ASYMPTOTES, DOMAIN & RANGE**

- 17) b) VA:  $x = 1$ ; HA:  $y = 0$

For each Rational Function, fill in the following information.

	Horizontal Asymptote	Vertical Asymptote	Domain	Range
18) $f(x) = \frac{5}{2x-6} + 2$	$y = 2$	$y = 3$	$\{x x \neq 3\}$	$\{y y \neq 2\}$
19) $f(x) = \frac{8x}{x+5}$	$y = 8$	$y = -5$	$\{x x \neq -5\}$	$\{y y \neq 8\}$

**XVIII. POLYNOMIALS - Operations**

- 20) c) 14      21)  $(f-g)(x) = x^2 - x - 2$       22)  $(fg)(x) = x^3 + 2x^2$       23)  $(g(f(x)))$  or  $(g \circ f)(x) = x^2 + 2$

**POLYNOMIALS - Identification**

- 24) a. YES...Degree = 7      b. NO (division by x)

**XIX. Graphs and Characteristics**

- 25)  $f(3) = 3$       26)  $(-3, -1)$       27)  $\emptyset$  (none)

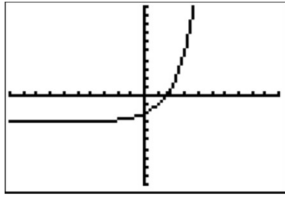
**XX. POLYNOMIALS**

- 50) a)  $x - int. = 0, -8, -1$  Each has a multiplicity of 1 (odd)...The graph will CROSS the x-axis at each x-intercept (0,0), (-8, 0), (-1, 0)  
 b)  $x - int. = -4, -1, 0, 1, 4$  Each has a multiplicity of 1 (odd)...The graph will CROSS the x-axis at each x-intercept (-4,0), (-1, 0), (0, 0), (1, 0), (4, 0)  
 51) a) Least possible degree = 3, Turning points = 2  
 b) Least possible degree = 5, Turning points = 4  
 52) D  
 53) D



Describe the end behavior for both functions graphed.

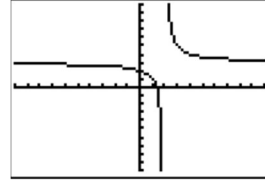
54)



$$f(x) = 2^x - 3$$

As  $x \rightarrow +\infty$ ,  $f(x) \rightarrow +\infty$  As  $x \rightarrow -\infty$ ,  $f(x) \rightarrow (-3)^+$

55)



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

**RIGHT Half**

As  $x \rightarrow +\infty$ ,  $f(x) \rightarrow (3)^+$

**LEFT Half**

As  $x \rightarrow -\infty$ ,  $f(x) \rightarrow (3)^-$

**ALSO**

As  $x \rightarrow 2^+$ ,  $f(x) \rightarrow +\infty$  As  $x \rightarrow 2^-$ ,  $f(x) \rightarrow -\infty$

56) a)  $\{\pm 1, \pm 2, \pm 3, \pm 6, \pm 9, \pm 18, \pm \frac{1}{2}, \pm \frac{3}{2}, \pm \frac{9}{2}\}$

57)

a)  $\{\pm 1, \pm 2, \pm 4, \pm 8\}$

b)  $x = -1, \pm 2\sqrt{2}$

c)  $f(-1) = 0$

d)  $f(2) = -12$

58)  $\{\pm 1, \pm 2, \pm 4, \pm 8, \pm 16\}$ ;  $x = -1, 1, \pm 4i$

59)  $x = -1, \pm 2\sqrt{2}$ ;  $x = -2, 1, \pm 2i$

### XXI. POLYNOMIAL Graphs and Characteristics

60) Least Possible degree: 4, Even, Negative Leading coefficient (a), Name the zeros:  $x = 4, x = -4$

Properly name an increasing interval:  $(-\infty, -2)$  or  $(0, 3)$ , Properly name a decreasing interval:  $(-2, 0)$  or  $(3, \infty)$ .

61)  $x \rightarrow +\infty$ ,  $f(x) \rightarrow -\infty$

$x \rightarrow -\infty$ ,  $f(x) \rightarrow +\infty$

. # Turning Points = 4

. Least POSSIBLE Degree of polynomial = 5, Odd

62) ROOTS:  $x = -2, x = -1, x = 1$

$x \rightarrow +\infty$ ,  $f(x) \rightarrow +\infty$

$x \rightarrow -\infty$ ,  $f(x) \rightarrow -\infty$

. # Turning Points = 2

. Least POSSIBLE Degree of polynomial = 3, Odd

63) The graph of the function to the right has an even multiplicity for the root found between  $x = 1$  and  $x = 2$

Because the graph BOUNCES at this root.