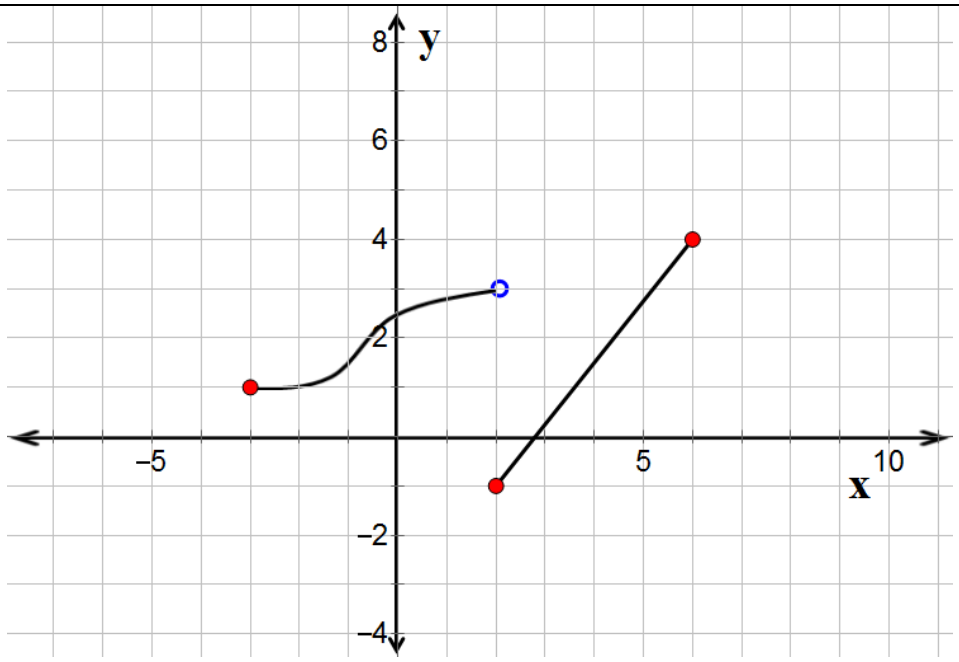
Final Exam Review (also counts as Quiz 7) Name:_____

Due May 10, 2016

Please show all your work.

1. Answer the following questions.

For the function below



a) Determine if the function is

o Function	o One-to-One
o Not a Function	o Not One-to-One

What is the value of

b) $f(5)$

c) $f(2)$

d) Domain

e) Range

2. The functions f us defined as follows: $f(x) = \begin{cases} 3\sqrt{x} & if\ x > 4 \\ 2x - 1 & if\ x < -4 \end{cases}$

Find the following. A) $f(4)$ b) $f(-1)$

3. Describe in your own words the difference between
    a. Polynomial and exponential function.
    b. Exponential and logarithmic function
    c. Write an expression for a function that best describes each of the data sets below.

x	y
-2	$\frac{1}{4}$
-1	$\frac{1}{2}$
0	1
1	2
2	4

$f(x) =$

x	y
-2	4
-1	1
0	1
1	2
2	4

$f(x) =$

x	y
$\frac{1}{4}$	-2
$\frac{1}{2}$	-1
1	0
2	1
4	2

$f(x) =$

4. Determine the inverse of each of the functions below. Find the domain rage of the function and its inverse.

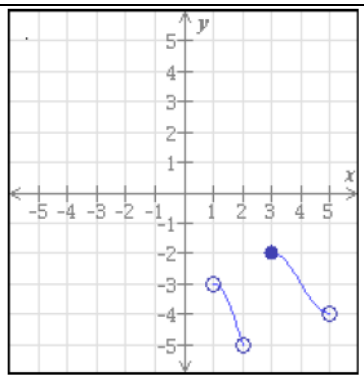
5. A species of an e-coli bacteria doubles every 30 minutes at room temperature. Write a function to represent the amount of these bacteria $A(t)$ at room temperature after t hours, if you initially started with 30000 bacteria.

a. Find the number of bacteria after 2 hours.
b. Find the number of bacteria at 4 hours.
c. How long will take for the bacteria to double in size?
d. When the bacteria reach a critical mass a person will get sick. Usually a critical mass is reached when the bacteria number 10 billion or more. So how many hours will take for a person to get sick. Round your answer to the nearest whole number as necessary.

6. Amy invested 2000 dollars into a savings account that paid compound interest of 4.3% compounded quarterly.
    a. How long will take for her money to grow to 3000$?
    b. How long will take for her money to double?

7. Find the domain and range of all the relations below either in interval notation or set notation as appropriate.

a)



Domain of S:

Range of S:

b) $f(x) = 2^x$

Domain of f:

Range of f:

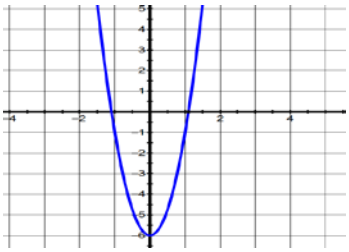
c) $g(x) = log_3 x$

Domain of g:

Range of g:

8. Find the difference quotient $\frac{f(x+h)-f(x)}{h}$ where $h \neq 0$ for the function below. Explain what this quotient represents. Simplify your answer as much as possible.

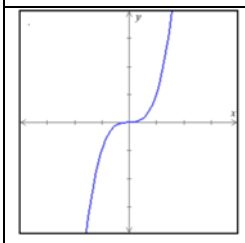
$$f(x) = 5x^2 - 6$$



9. Determine if the functions below are odd, even, neither.

$y = x^2 - x$

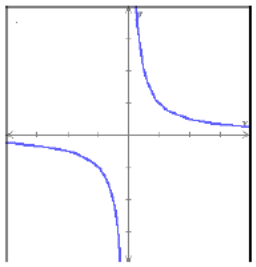
Odd Even Neither



Odd Even Neither

$y = |x|$

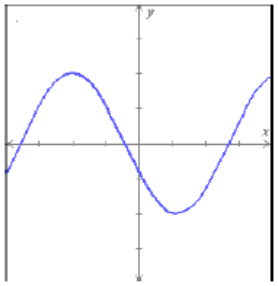
Odd Even Neither



Odd Even Neither

$y = x^3 - 3x$

Odd Even Neither



Odd Even Neither

10. Two functions g and f are defined in the figure below. Find the domain and range of the compositions $f \circ g(x) = f(g(x))$, and $g \circ f(x) = g(f(x))$. Then evaluate the function values below.

$g(x) = \frac{x+6}{x-5}$, and $f(x) = 2x - 7$

Domain of f Domain of g	Range of f Range of g
Domain of $f \circ g(x) = f(g(x))$ Domain of $g \circ f(x) = g(f(x))$	Range of $f \circ g(x) = f(g(x))$ Range of $g \circ f(x) = g(f(x))$

a. $f \circ g(x)$	b. $g \circ f(6)$	c. $f \circ g(6)$	d. $g \circ f(0)$

11. Find the inverses of the following one-to-one functions. Then find the domains and ranges of the functions and their inverses.

a) $f(x) = \frac{7x+1}{2x-1}$

b) $g(x) = 2^x$

Domain of f	Range of f^{-1}	Domain of g	Range of g^{-1}
Domain of f^{-1}	Range of f	Domain of g^{-1}	Range of g

12. Rewrite the exponential equations in logarithmic form and logarithmic equations in exponential form. If possible simplify your answers.

Exponential Equation	Logarithmic Equation
$e^x = 5$	
$2^{x+1} = 8$	
	$log_2(x) = -1$
	$\log(x+1) = 2$
	$\ln(x+1) = 3$
$5^{1-x} = 3$	
	$log_{\frac{1}{2}}(x) = -3$

13. Expand the following. Each logarithm in your answer should involve only one variable. Assume that all variables are positive.

a) $\log(x^3y^2) =$_____

b) $\log_2\left(\frac{x^3y^2}{\sqrt{z}}\right) =$_____

c) $\log\left(\frac{x^3}{\sqrt{z^5y}}\right) =$_____

14. Write the following as one term.

a) $4log_2x + 2log_2y =$ _____

b) $\frac{1}{3}logx - 2logy + 3logz =$ _____

15. Evaluate the following for the functions defined below.
$f(x) = 3x - 1$ and $g(x) = x^2 + 2$

a) $(f+g)(x) =$ _____

b) Domain of $(f+g)$

c) $(f+g)(3) =$ _____

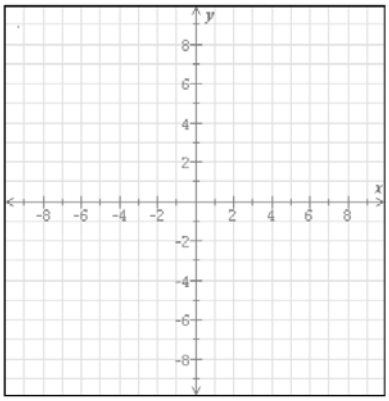
d) $(fg)(x) =$ _____

e) Domain of $(fg) =$ _____

f) $(fg)(0) =$ _____

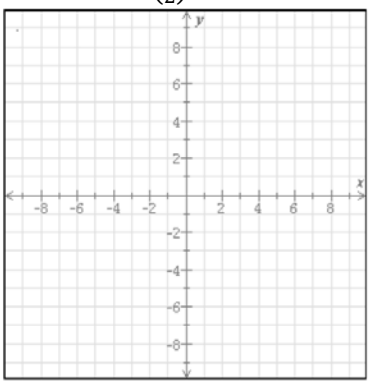
Sketch the graphs of the following equations. Sketch and label all the asymptotes if there are any. Label all important aspects of the graphs. For conic sections find the center all other relevant information.

16. $y = e^{x+3} - 1$



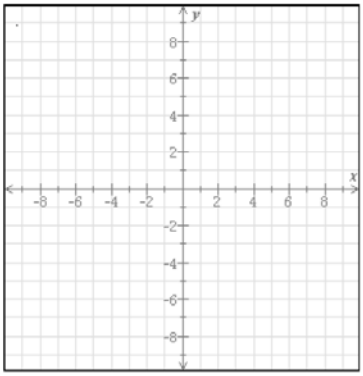
x	y

17. $y = \left(\frac{1}{2}\right)^{x-1} + 2$



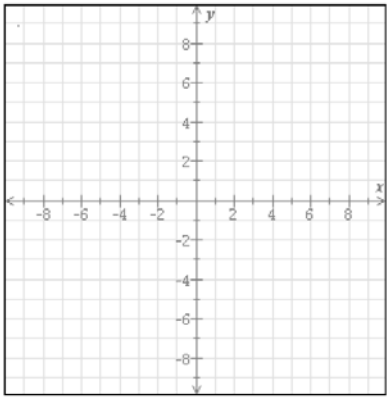
x	y

18. $y = 2x^2 - 3x + 1$



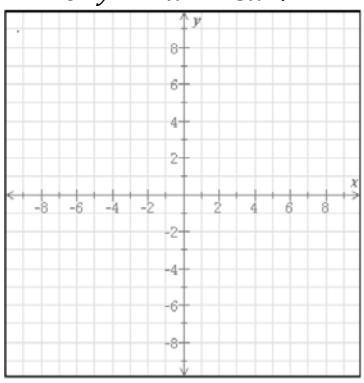
x	y

19. $y = log_2(x + 3) - 1$



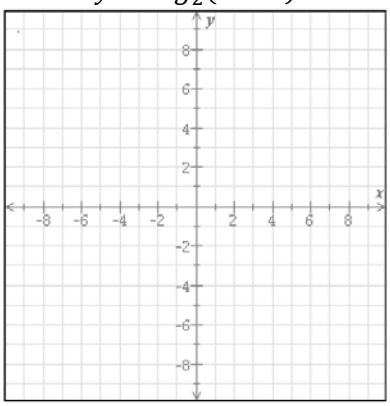
x	y

20. $y = 2x^2 - 3x + 1$



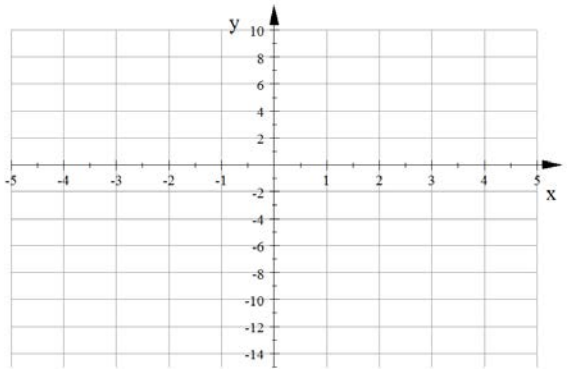
x	y

21. $y = log_2(x + 3) - 1$



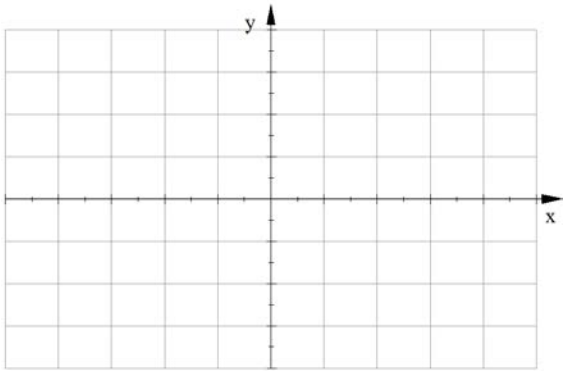
x	y

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



x	y

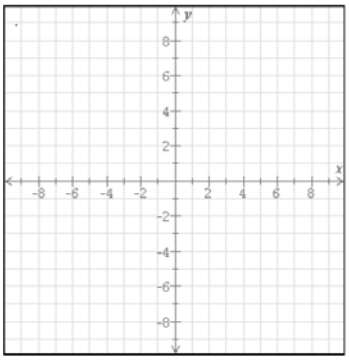
23. $y = \frac{3x^2-2x-1}{x+1}$



x	y

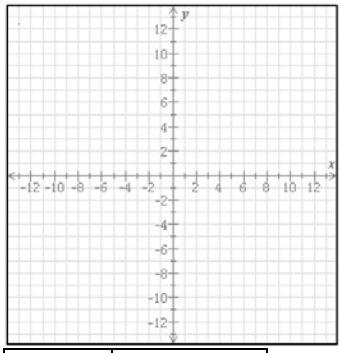
24. $y + 4 = 4(x - 1)^2$

Focus:_____ Vertex: _____



25. $2y^2 - 16y - x + 29 = 0$

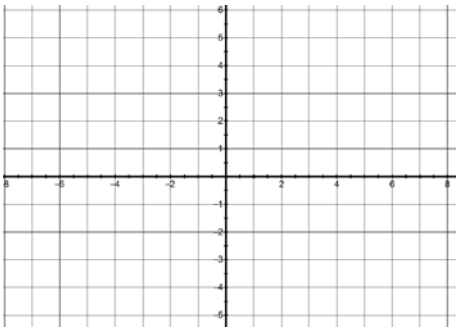
Focus:_____ Vertex:_____



x	y

26. $2x^2 + 8x + 2y^2 - 14y = -\frac{29}{2}$

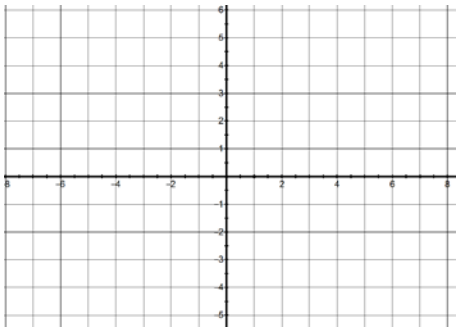
Center: _____ Radius:_____



27. $4x^2 - 16x + 9y^2 - 18y = 11$

Center: _____

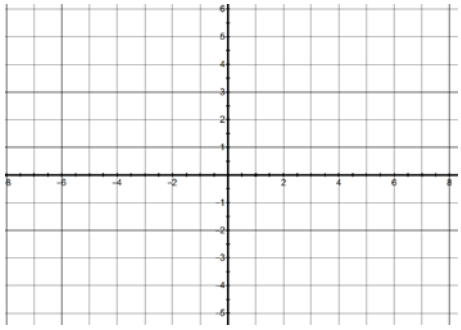
$a =$_____ $b =$_____



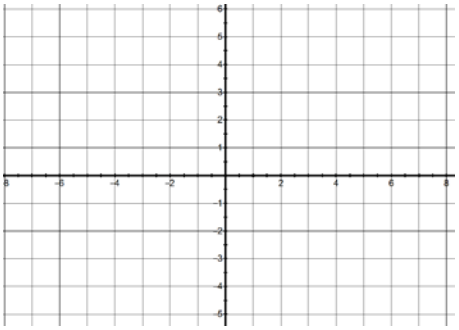
28. $4x^2 - 16x - 9y^2 + 18y = 29$

Center: _____

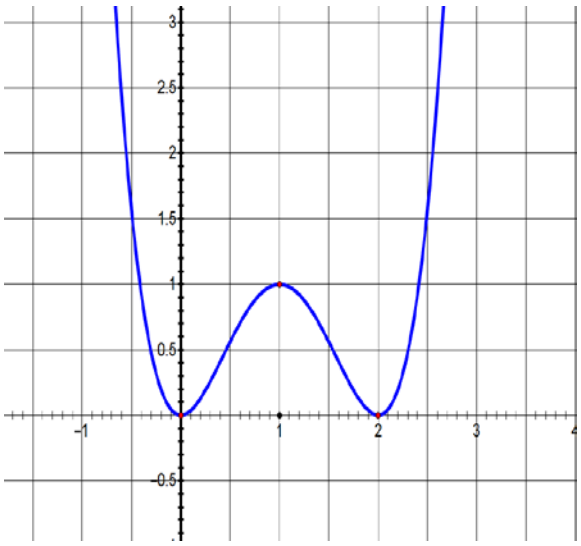
$a =$_____ $b =$_____



29. $3y^2 - 4x + 6y = 4$



30. Determine the interval(s) on which the function is (strictly) increasing, or decreasing, or constant. Write your answer in interval notation. (4 pts)



Increasing: _____

Decreasing: _____

Constant: _____

31. Solve the following equations and if there are extraneous solutions, please state so.

a) $(x-1)^2 - 37(x-1) - 36 = 0$

b) $2x(x-1)^3(2x+3)^4(5-x)^2(x^2+4) = 0$

c) $h(x) = x^3 + 8x^2 + 30x + 36.$
(Hint: Use rational zero's theorem)

d) $log_3(2x-1) + log_3(x+1) = 2$

e) $4 + \log(2x-1) = 5$

f) $3x^2 - 5x + 2 = 3x - 1$

g) $2^{x^2-61x} = 64^{3-9x}$

h) $17^{-x-3} = 16^{-8x}$

i) $500e^{0.03t} = 2000$

32. Solve the following systems of equations.

a) $\begin{cases} y = 3x - 4 \\ 4x + 3y = 27 \end{cases}$

Solution: $(x, y) =$ _____

b) $\begin{cases} 2x - 3y + z = 7 \\ 3x + 2y - 2z = -3 \\ -x + y + 3z = 4 \end{cases}$

(you may want to use Gauss Jordan Elimination method)

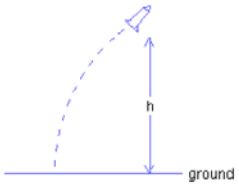
33. Solve the following

a) The length of a rectangle is 5 yd less than twice the width, and the area of the rectangle is 33 yd^2. Find the dimensions of the rectangle.

b) A rocket model is launched with an initial velocity of 235 ft/s. The rocket's height h (in feet) after t seconds is given by the following.

a. $h = 235t - 16t^2$

Find all the values of t for which the rocket's height is 151 feet. Round your answers to the nearest hundredth. If there is more than one answer, use or to separate them.



c) The profit P in (dollars) of selling x cupcakes a club fund raiser is given by the function $P(x) = -0.0075x^2 + 1.125x$. What is the maximum profit you will make at the fund raiser? How many cupcakes will you need to sell to make this profit? Round your answer to the nearest dollar.

d) A car is purchased for $\$28{,}500$. After each year the resale value decreased by 35%. What will be the resale value be after 4 years? Round your answer to the nearest dollar. (Write your final answer in a sentence.)

e) A loan of $\$39{,}000$ is made at 5% interest, compounded annually. After how many years will the amount due reach $\$63{,}000$ or more? (Use a calculator if necessary.) Write the smallest possible whole number answer.

f) The number of bacteria in a certain population increases according to a continuous exponential growth model, with a growth rate parameter of 4.1% per hour. How many hours will it take for the sample to double?

Note: This is a continuous growth model.

Do not round any intermediate computations, and round your answer to the nearest whole hundredth.

g) An initial amount of $\$1800$ is invested in an account at an interest rate of 2% per year compounded continuously. Find the amount in the account after 6 years. Round your answer to nearest cent.