Dear AP Calculus Student,

Welcome to AP Calculus AB!

I am looking forward to working with you for the next school year. We have a lot to accomplish to prepare you for the exam and your college or university, so there is a summer packet that is due the first day of class. It is available as a PDF for you to print here. It is for a grade; you may use your notes from previous years.

If you have any questions or concerns, you can contact me on TEAMS.

Have a great summer!

Kim Henderson

Name _____ Section P.1 – Preparing for Calculus Worksheet #1

Solve.

1. Given $g(x) = x^2 + 2x + 3$

   Find a. $g(-1)$ b. $g(x + 5)$ c. $g(-x)$

2. Given $f(r) = \sqrt{r + 6} + 3$

   Find a. $f(-6)$ b. $f(10)$ c. $f(x - 6)$

3. Find the domain of the following functions:

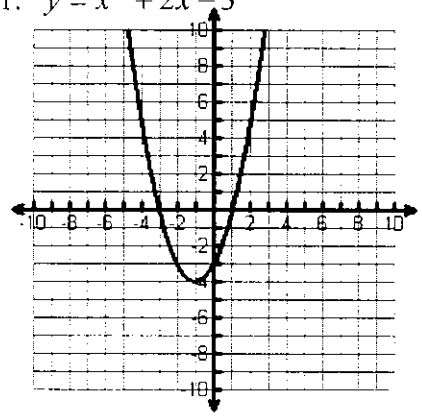
   a. $f(x) = \dfrac{\sqrt{4x - 8}}{6x + 2}$ b. $g(x) = 4x + 1$ c. $f(x) = |x + 2|$

   d. $g(x) = 2x^3 + 4x - 1$ e. $h(x) = \dfrac{\sqrt{x - 2}}{x - 5}$ f. $f(x) = \sqrt{2x - 6}$

Name _____ Section P.1 – Preparing for Calculus Worksheet #2

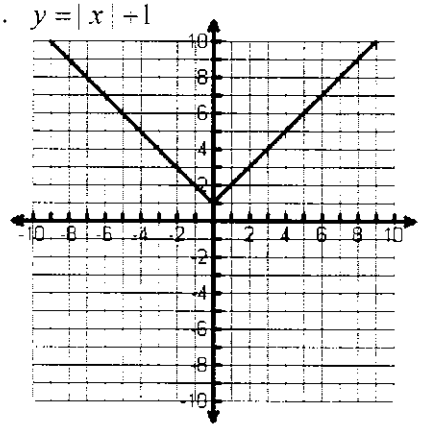
Use the graph of each function to determine the domain, range, x-intercepts (if any), y-intercepts (if any), and the function values (as indicated).

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



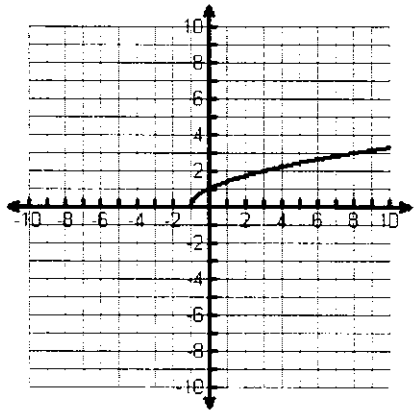
Domain = _____
Range = _____
x-intercept(s) = _____
y-intercept = _____
$f(0)$ = _____

2. $y = |x| + 1$



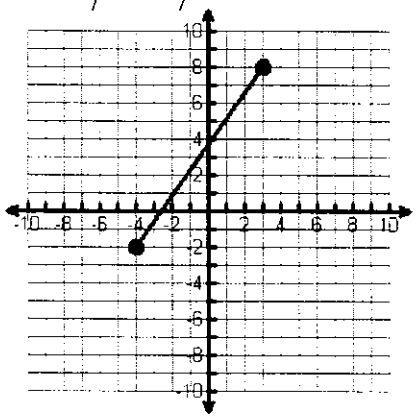
Domain = _____
Range = _____
x-intercept(s) = _____
y-intercept = _____
$f(-5)$ = _____

3. $y = \sqrt{x+1}$



Domain = _____
Range = _____
x-intercept(s) = _____
y-intercept = _____
$f(5)$ = _____

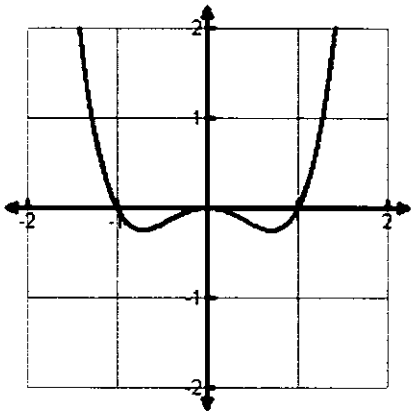
4. $y = \frac{10}{7}x + \frac{26}{7}$ $[-4, 3]$

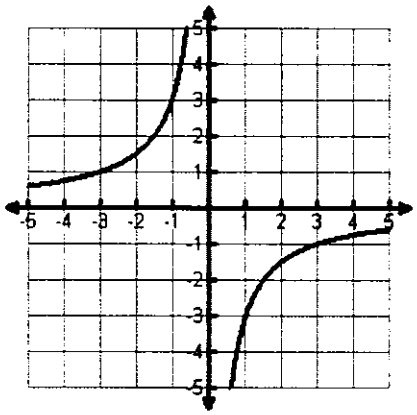


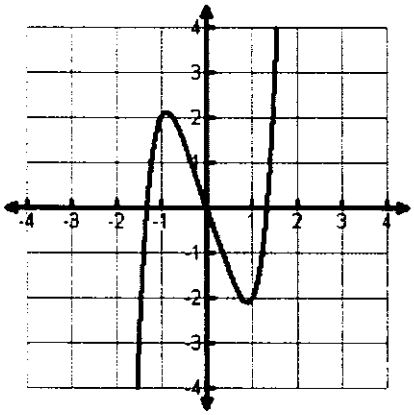
Domain = _____
Range = _____
x-intercept(s) = _____
y-intercept = _____
$f(-1)$ = _____

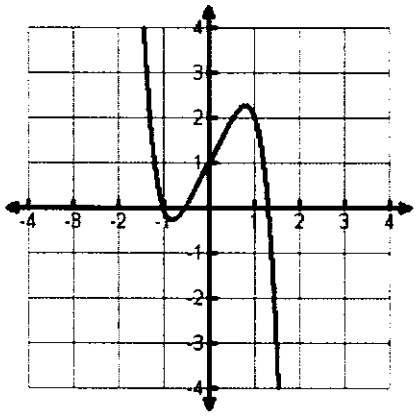
Name _____ Section P.1 – Preparing for Calculus Worksheet #3

Use possible symmetry to determine whether each graph is the graph of an even function, an odd function, or a function that is neither even nor odd.

1. 

2. 

3. 

4. 

5. Find the average rate of change of $f(x) = -x^2 + 4$

   a. From 0 to 3

   b. From –2 to 2

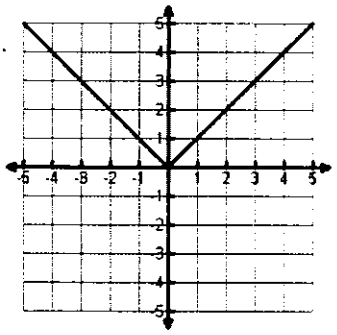
Name _____ Section P.2 – Library of Functions Worksheet #1

Match each function with its equation, and identify the type of function.

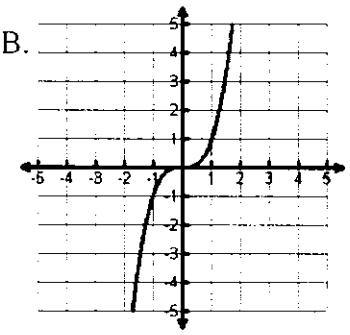
Equations:

1. _____ $f(x) = x^2$
2. _____ $f(x) = x$
3. _____ $f(x) = 2$
4. _____ $f(x) = |x|$
5. _____ $f(x) = x^3$
6. _____ $f(x) = \sqrt{x}$
7. _____ $f(x) = \dfrac{1}{x}$
8. _____ $f(x) = \begin{cases} -x - 3 & \text{if } x \le 2 \\ 3 & \text{if } x > 2 \end{cases}$

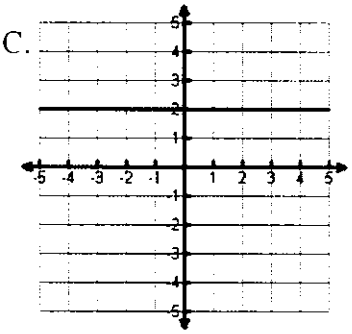
A.



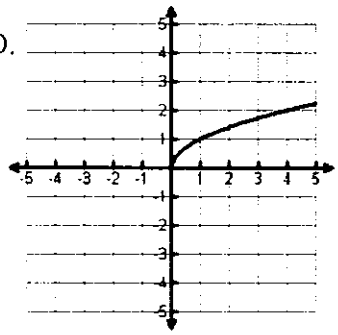
B.



C.



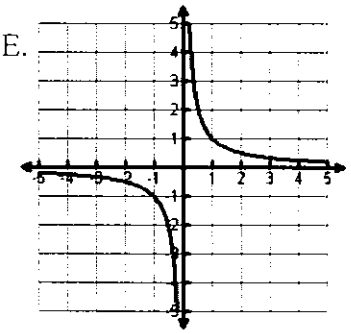
D.



Type of Function:

1. _____ Constant
2. _____ Root
3. _____ Rational
4. _____ Piecewise
5. _____ Quadratic
6. _____ Identity
7. _____ Cubic
8. _____ Absolute Value

E.



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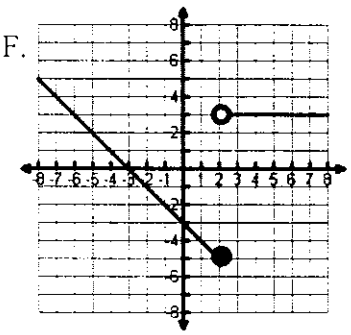
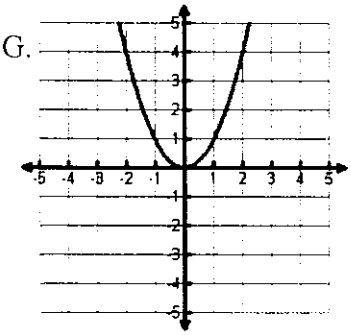
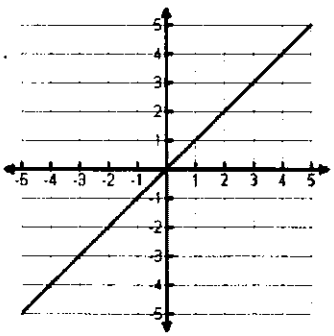


G.



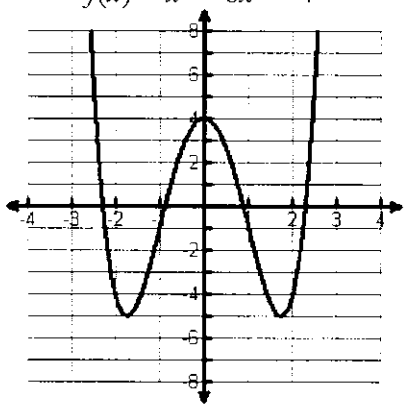
H.



Name _____ Section P.2 – Library of Functions Worksheet #2

Use the graph and equation at the right to answer numbers 1–9.

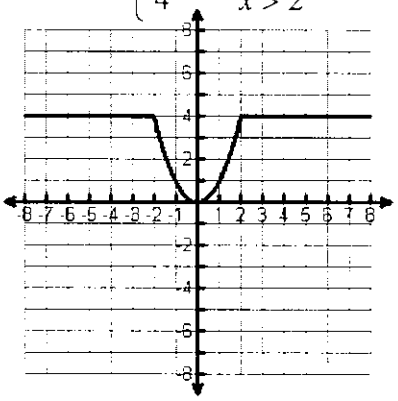
$f(x) = x^4 - 6x^2 + 4$



1. What is the domain of this function? _____
2. What is the range of this function? _____
3. Is this function even, odd, or neither? _____
4. Approximate the x-intercept(s). _____
5. What is the y-intercept? _____
6. Evaluate $f(-2)$ = _____ $f(3)$ = _____ and $f(-1)$ = _____
7. Over what interval(s) is this function increasing? _____
8. Over what interval(s) is this function decreasing? _____
9. Over what interval(s) is this function constant? _____

Use the graph and equation at the right to answer numbers 10–18.

$$f(x) = \begin{cases} 4 & x < -2 \\ x^2 & -2 \le x \le 2 \\ 4 & x > 2 \end{cases}$$



10. What is the domain of this function? _____
11. What is the range of this function? _____
12. Is this function even, odd, or neither? _____
13. Approximate the x-intercept(s). _____
14. What is the y-intercept? _____
15. Evaluate $f(-2)$ = _____ $f(3)$ = _____ and $f(-1)$ = _____
16. Over what interval(s) is this function increasing? _____
17. Over what interval(s) is this function decreasing? _____
18. Over what interval(s) is this function constant? _____

Name _____ Section P.3 – Operations on Functions Worksheet #1

In Problems 1 and 2, the functions f and g are given. Find each of the following:

1. If $f(x) = 2x^2 - 5$ and $g(x) = 3x + 7$, find:

   a. $(f + g)(x)$

   b. $(f - g)(4)$

2. If $f(x) = \sqrt{x-6}$ and $g(x) = \sqrt{x+2}$, find:

   a. $(f + g)(x)$

   b. The domain of $f + g$

The functions f and g are given. Find each of the following and determine their domain.

3. $f(x) = 2x + 3, \quad g(x) = x - 1$

   a. $(f - g)(x)$

   b. $(f - g)(x)$

   c. $(f \cdot g)(x)$

   d. $\left(\frac{f}{g}\right)(x)$

Name _____ Section P.3 – Operations on Functions Worksheet #2

For each of the following functions, find $(f \circ g)(x)$ and state its domain.

1. $f(x) = \dfrac{2}{x+3}$ $g(x) = \dfrac{1}{x}$

   a. $(f \circ g)(x)$ b. Domain:

2. $f(x) = \sqrt{x}$ $g(x) = x - 3$

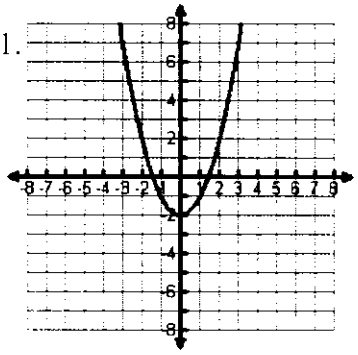
   a. $(f \circ g)(x)$ b. Domain:

3. $f(x) = 4 - x^2$ $g(x) = \sqrt{x^2 - 4}$

   a. $(f \circ g)(x)$ b. Domain:

Name _____ Section P.3 – Transformations of Functions Worksheet #3

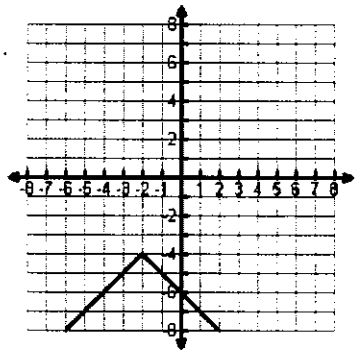
For each of the following problems, identify the basic function: quadratic (x^2), cubic (x^3), absolute value $|x|$, square root ($\sqrt{x}$). Observe the transformation, and write the equation of the graph.

1. 

Basic function:

_____

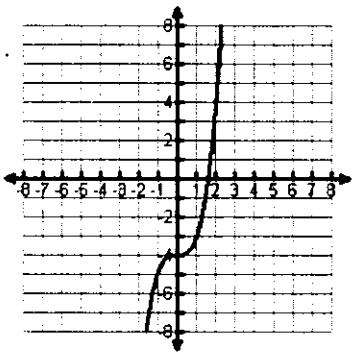
$f(x)$ = _____

2. 

Basic function:

_____

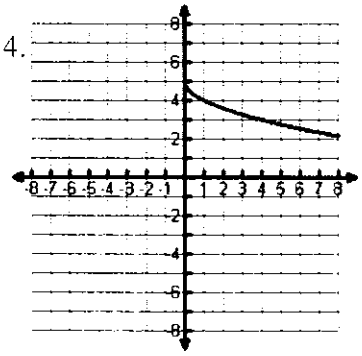
$f(x)$ = _____

3. 

Basic function:

_____

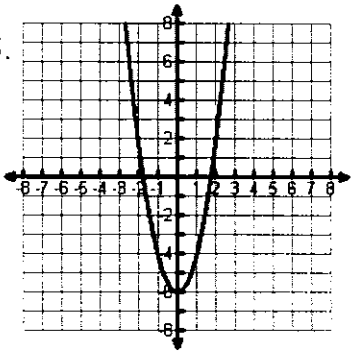
$f(x)$ = _____

4. 

Basic function:

_____

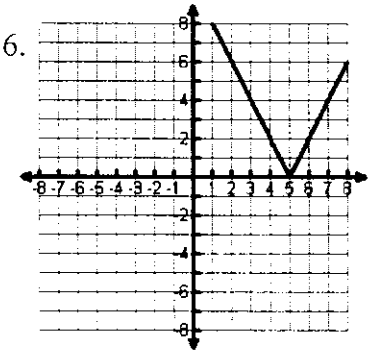
$f(x)$ = _____

5. 

Basic function:

_____

$f(x)$ = _____

6. 

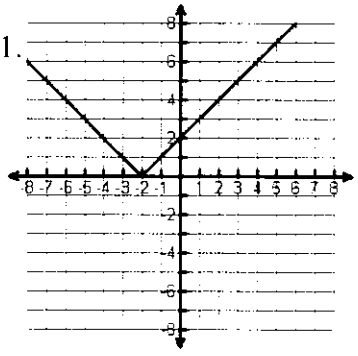
Basic function:

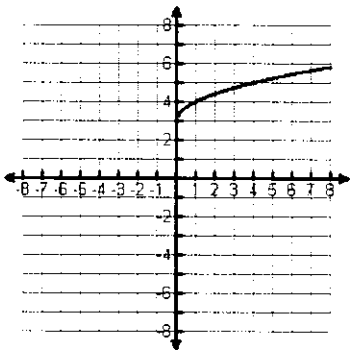
_____

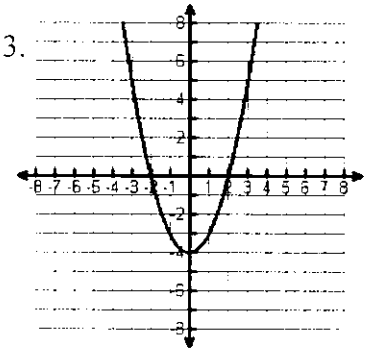
$f(x)$ = _____

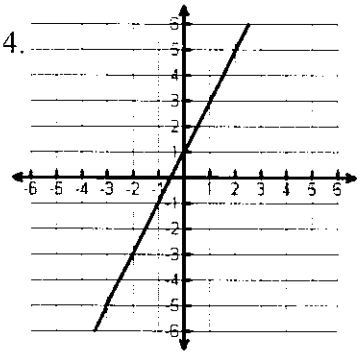
Name _____ Section P.4 – Inverse Functions Worksheet #1

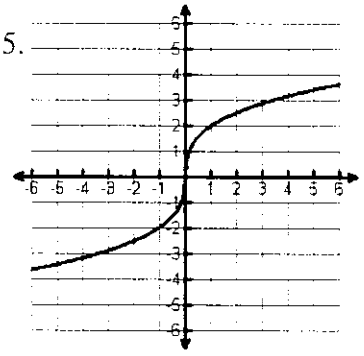
In Problems 1–6, the graph of a function f is given. Use the Horizontal Line Test to determine whether f is one-to-one. If it is one-to-one, sketch the inverse.

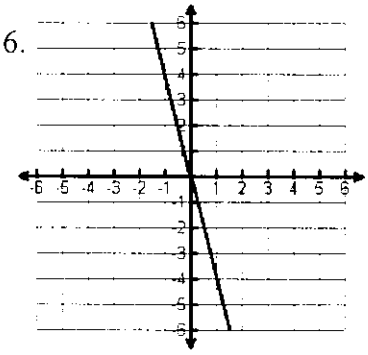
1. 

2. 

3. 

4. 

5. 

6. 

Identify which of the following functions have inverses:

7. $f(x) = (x - 1)^3$

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

9. $f(x) = -x + 5$

10. $f(x) = 3^x$

Name _____ Section P.4 – Inverse Functions Worksheet #2

Find $(f \circ g)(x)$ or $(g \circ f)(x)$ to determine whether each pair of functions are inverses.

1. $f(x) = 3x + 8$, $g(x) = \dfrac{x-8}{3}$

2. $f(x) = x^3 + 1$, $g(x) = \sqrt[3]{x-1}$

3. $f(x) = \dfrac{3}{x+4}$, $g(x) = \dfrac{3}{x} + 4$

4. $f(x) = -x$, $g(x) = -x$

Find an equation for $f^{-1}(x)$, the inverse function, and then verify that your equation is correct by showing that $(f \circ f^{-1})(x) = x$.

5. $f(x) = x + 3$

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

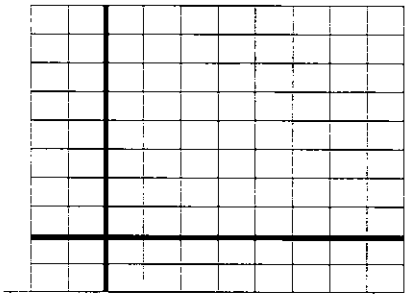
7. $f(x) = \dfrac{1}{x}$

Name _____ Section P.5 – Exponential and Logarithmic Functions Worksheet #1

For Problems 1–4, graph each function and describe the transformation, if any.

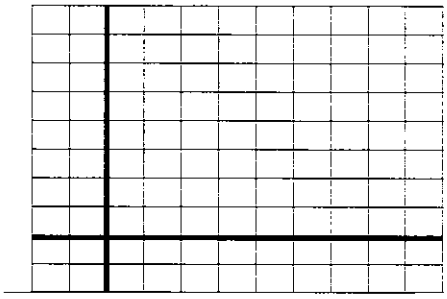
1. $f(x) = 2^x$

x	y
−1	
0	
1	
2	



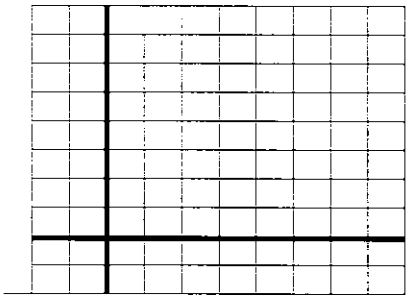
2. $f(x) = (\frac{1}{2})^x$

x	y
−1	
0	
1	
2	



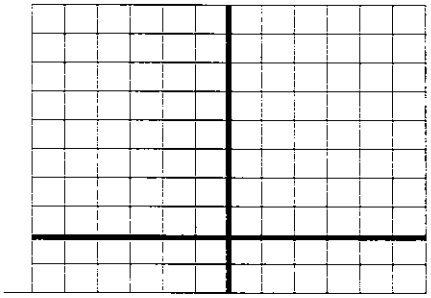
3. $f(x) = 2^{x+1}$

x	y
−1	
0	
1	
2	



4. $f(x) = 2^{-x}$

x	y
−1	
0	
1	
2	



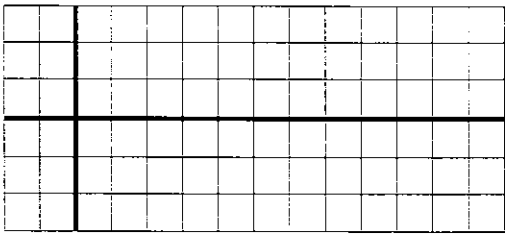
5. Sketch the graph of the common logarithmic function $f(x) = \log x$ and describe its features.

   a. Domain: _____

   b. Range: _____

   c. x-intercept: _____

   d. Asymptote: _____



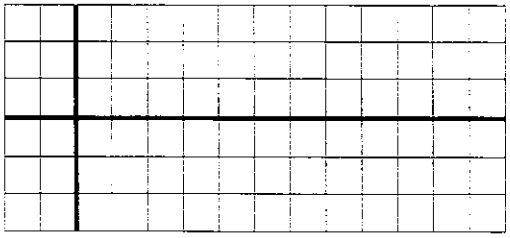
6. Sketch the graph of the common logarithmic function $f(x) = \ln x$ and describe its features.

   a. Domain: _____

   b. Range: _____

   c. x-intercept: _____

   d. Asymptote: _____



Name _____ Section P.5 – Exponential and Logarithmic Functions Worksheet #2

Solve each equation.

1. $4^x = 16$

2. $7^x = \frac{1}{49}$

3. $\log(z - 3) = 2$

4. $5^{-x^2} = 0.2$

5. $4e^{2x} = 5$

6. $e^x - 5 = 60$

7. $\ln(2x) = 4$

8. $7 - 2e^x = 5$

9. $5 + 2\ln(x) = 4$

10. $\ln\sqrt{x+2} = 1$

Name _____ Section P.5 – Exponential and Logarithmic Functions Worksheet #3

Compound interest is one of the most popular applications of exponential functions. If money invested is compounded continuously, the amount at the end of the time frame can be found using the following equation:

$$\mathbf{A = Pe^{rt}}$$

Where A = Amount at the end of the time frame, P = Initial Principle Invested, r = Annual Interest Rate, and t = Time in Years.

If your money doubles in value, then the final amount (A) is double what you started with (P). So the equation becomes

$$2P = Pe^{rt}$$

If you divide both sides by P you get: $2 = e^{rt}$

Suppose the rate is 5%, then you have: $2 = e^{0.05t}$

To solve, take the natural log of both sides: $\ln 2 = \ln e^{0.05t}$

Rewrite using log properties: $\ln 2 = (0.05t)(\ln e)$

Since $\ln e = 1$, the equation simplifies to: $\ln 2 = 0.05t$

Dividing by 0.05, we find that $t = 13.863$ $t = 13.863$ years for our money to double

Keep in mind that it doesn't matter *how much* money is invested. **Now you try!**

Calculate how long it will take for an investment at an annual interest rate of 3.5% to:

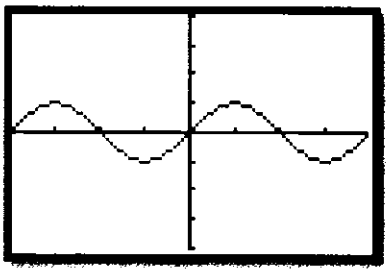
a. Double in value

b. Triple in value

Name _____ Section P.6 – Trigonometric Functions Worksheet #1

Identify the domain, range, and period of each trigonometric function shown below. Classify each function as Even or Odd.

1. $y = \sin x$



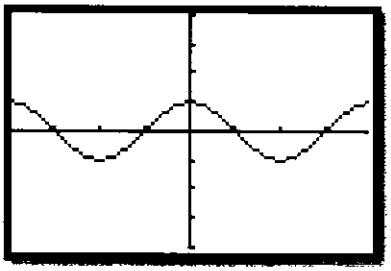
Domain: _____

Range: _____

Period = _____

Even or Odd?

2. $y = \cos x$



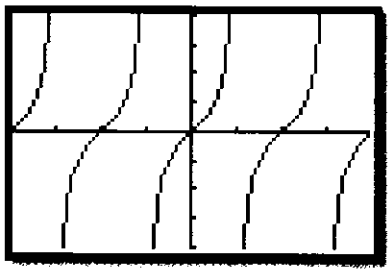
Domain: _____

Range: _____

Period = _____

Even or Odd?

3. $y = \tan x$



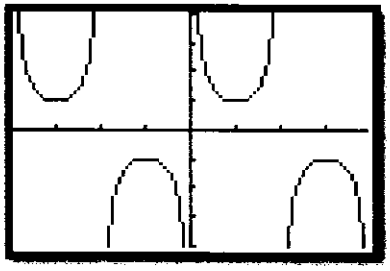
Domain: _____

Range: _____

Period = _____

Even or Odd?

4. $y = \csc x$



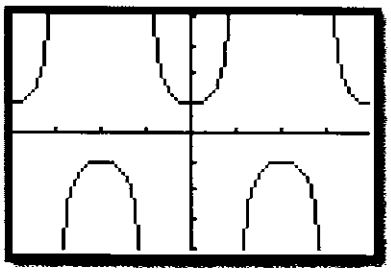
Domain: _____

Range: _____

Period = _____

Even or Odd?

5. $y = \sec x$



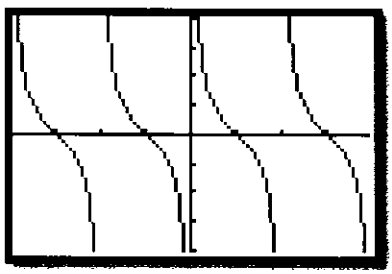
Domain: _____

Range: _____

Period = _____

Even or Odd?

6. $y = \cot x$



Domain: _____

Range: _____

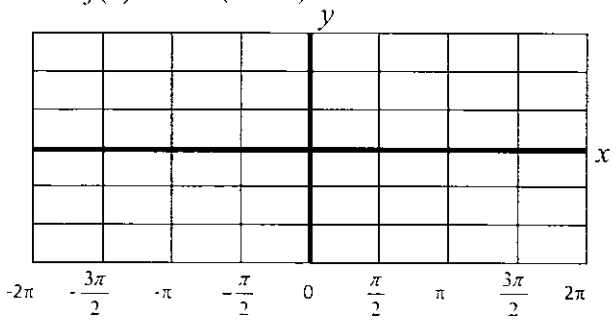
Period = _____

Even or Odd?

Name _____ Section P.6 – Trigonometric Functions Worksheet #2

For Problems 1 and 2, graph one period of the trigonometric function.

1. $f(x) = 3\sin(x + \pi)$



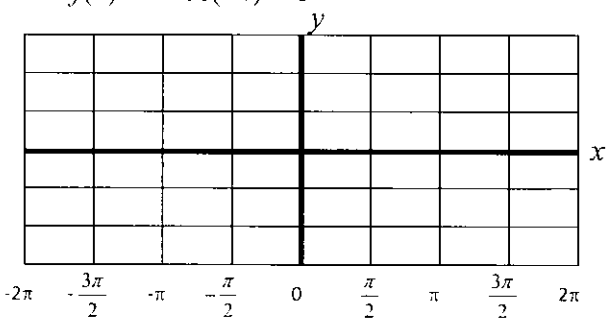
Amplitude = _____

Period = _____

Phase Shift = _____

Vertical Shift = _____

2. $f(x) = -\cos(2x) - 1$



Amplitude = _____

Period = _____

Phase Shift = _____

Vertical Shift = _____

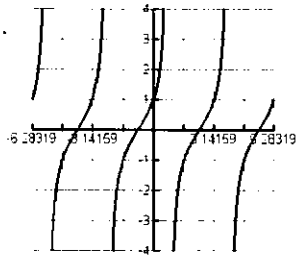
Match the equation to its graph.

3. $y = \tan\left(x + \frac{\pi}{4}\right)$

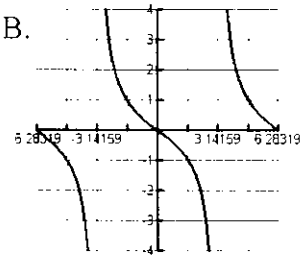
4. $y = \tan\left(x - \frac{\pi}{4}\right)$

5. $y = -\tan\frac{x}{2}$

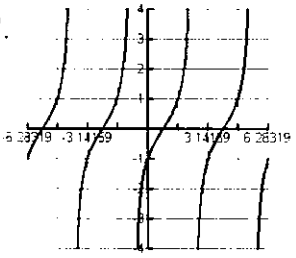
A.



B.



C.



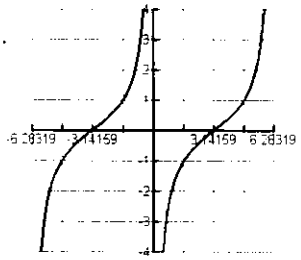
Match the equation to its graph.

6. $y = \cot\left(x + \frac{\pi}{4}\right)$

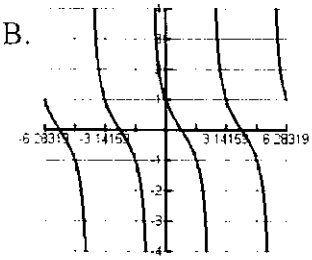
7. $y = \cot\left(x - \frac{\pi}{4}\right)$

8. $y = -\cot\frac{x}{2}$

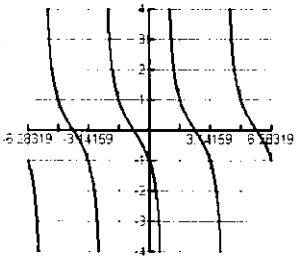
A.



B.



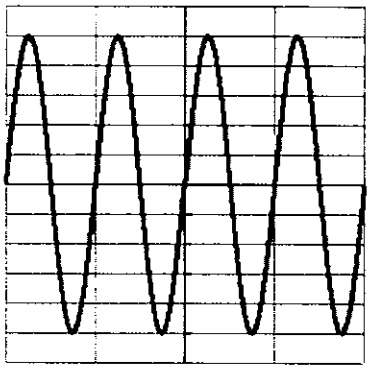
C.



Name _____ Section P.6 – Trigonometric Functions Worksheet #3

Specify the period and amplitude that is shown for each of the following trigonometric functions.

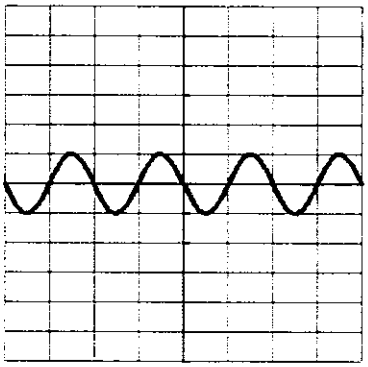
1. $y = 5\sin(4x)$



Period = _____

Amplitude = _____

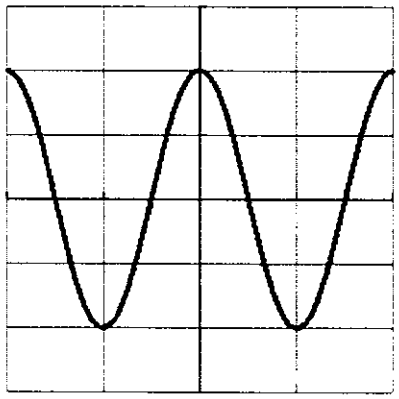
2. $y = -\sin(2x)$



Period = _____

Amplitude = _____

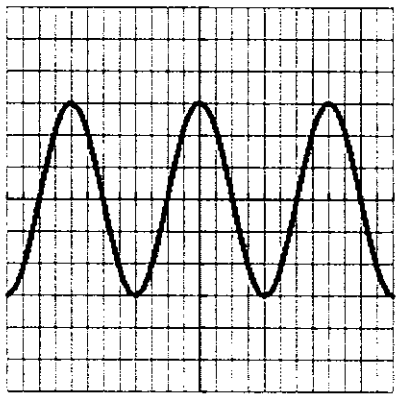
3. $y = 2\cos(\pi x)$



Period = _____

Amplitude = _____

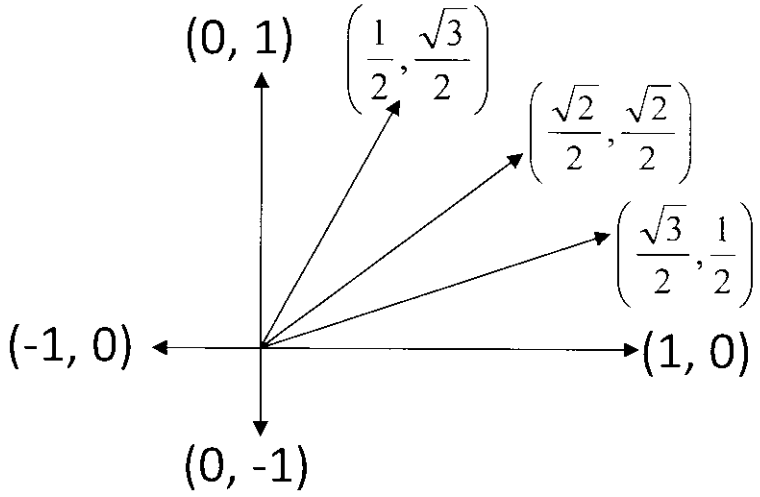
4. $y = 3\cos\left(\frac{\pi}{4}x\right)$



Period = _____

Amplitude = _____

Name _____ Section P.7 – Inverse Trigonometric Functions Worksheet #1



In Problems 1–9, find the exact value of the expression.

1. $\sin^{-1}(0.5) =$

2. $\sin^{-1}\left(-\frac{\sqrt{2}}{2}\right) =$

3. $\tan^{-1}(1) =$

4. $\cos^{-1}\left(\frac{\sqrt{3}}{2}\right) =$

5. $\tan^{-1}(\sqrt{3}) =$

6. $\cos^{-1}(0) =$

7. $\sin^{-1}(1) =$

8. $\tan^{-1}(0) =$

9. $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right) =$

Name _____ Section P.7 – Inverse Trigonometric Functions Worksheet #2

In Problems 1–6, solve each equation on the interval $0 \le \theta < 2\pi$.

1. $2\cos 3t - 1 = 0$

2. $\csc x = 2$

3. $4\tan\left(\frac{t}{2}\right) + 4 = 0$

4. $2\sin x + 1 = 0$

5. $2\sin^2 x + \sin x = 1$

6. $sec^2 t - 2\,tan\,t = 4$