

The Summer Before Calculus Study Guide

Review. Fill in the formulas/information below to serve as your study guide.

Distance Formula:

Slope Formula:

Equations of lines:

Vertical Line:

Horizontal Line:

Slope-Intercept Form:

Point-Slope Form:

Standard Form:

Parallel and Perpendicular Lines:

Parallel lines have the _____ slope.

Perpendicular lines have slopes that are _____

Trigonometric Ratios:

• $\sin \theta =$

• $\cos \theta =$

• $\tan \theta =$

• $\csc \theta =$

• $\sec \theta =$

• $\cot \theta =$

Trigonometric Pythagorean Identities

1.

2.

3.

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Review. Fill in the formulas/information below to serve as your study guide.

Properties of Logarithms:

1. Product:
2. Quotient:
3. Power:

Graph $y = \ln x$ and $y = e^x$

$$y = \ln x$$

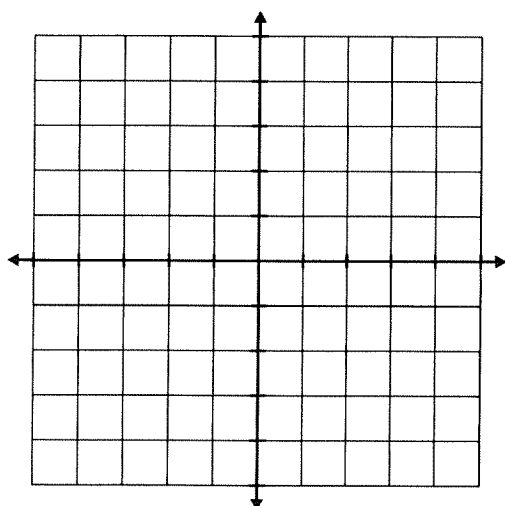
Domain: _____

Range: _____

$$y = e^x$$

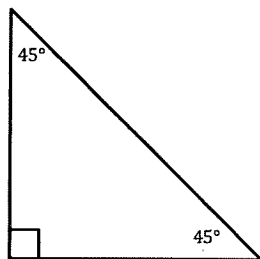
Domain: _____

Range: _____

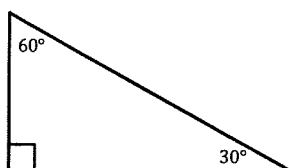


Label 3 Special Right Triangles:

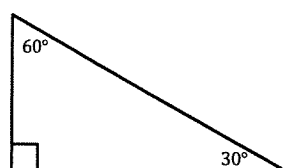
$45^\circ - 45^\circ - 90^\circ$



$30^\circ - 60^\circ - 90^\circ$ (make short leg x)



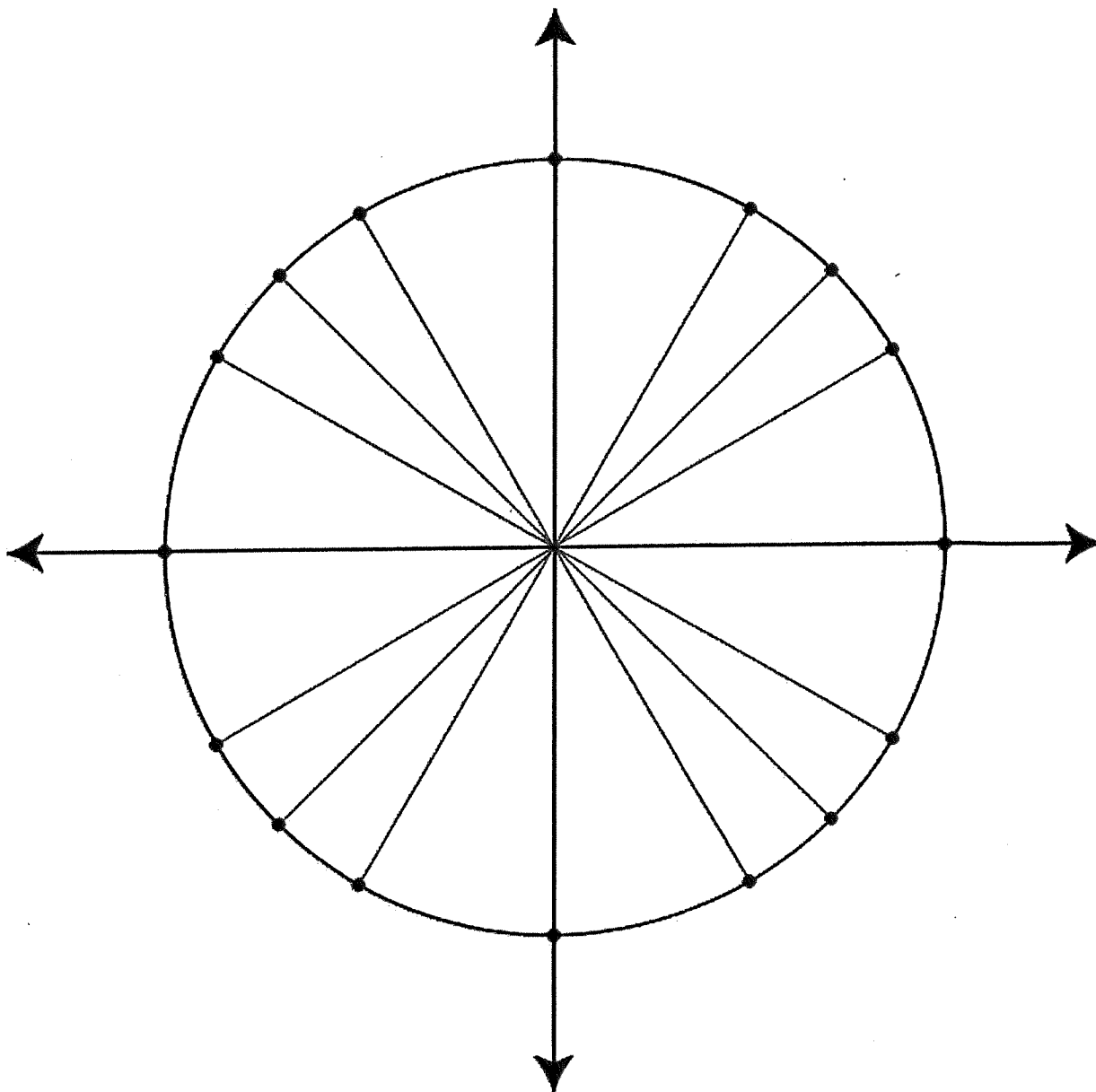
$30^\circ - 60^\circ - 90^\circ$ (make long leg x)



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Unit Circle

Directions: Label radians, degrees, and points for EVERY angle on the unit circle below.





Use the formula sheet
if you need help.

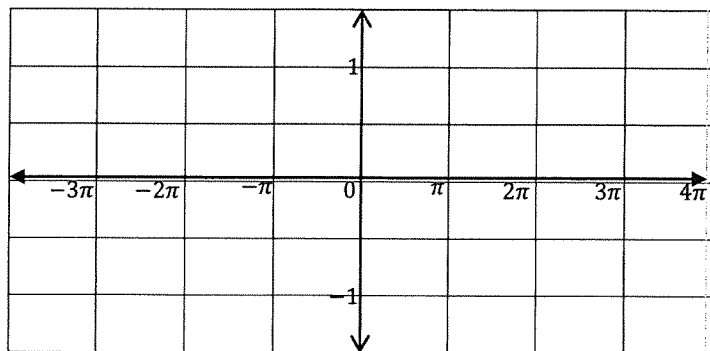
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Trigonometric Functions

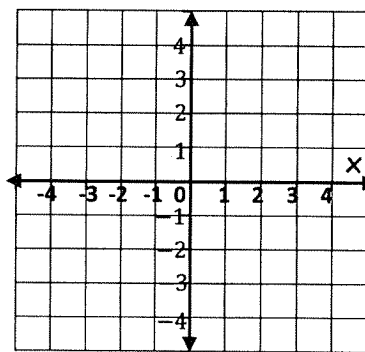
1. Evaluate: $\sin^2\left(\frac{\pi}{8}\right) + \cos^2\left(\frac{\pi}{8}\right) =$

2. Graph the following:

a. $f(x) = \cos x$



b. $f(x) = 3\sin\frac{\pi x}{2}$



3. Simplify the following using only sine, cosine, or tangent:

a. $\frac{1}{\sec x} =$

b. $\sec^2 x - 1 =$

c. $\frac{\sin x}{\cos x} =$

d. $\frac{\cot x}{\csc x} =$

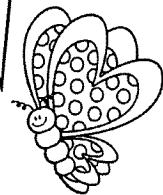
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Answer as fast and accurately as you can.

The Unit Circle

Knowing the unit circle, just like knowing arithmetic facts, will help you tremendously in calculus and beyond.

Try to answer the following without help. If you don't know most of them, review the unit circle until you do.



1. $\sin\frac{\pi}{2} =$

2. $\sin\frac{\pi}{3} =$

3. $\sin\frac{5\pi}{4} =$

4. $\cos\pi =$

5. $\cos\frac{3\pi}{4} =$

6. $\cos\frac{\pi}{6} =$

7. $\tan\frac{\pi}{4} =$

8. $\tan\frac{11\pi}{6} =$

9. $\tan 0 =$

10. $\sin\frac{5\pi}{6} =$

11. $\tan\pi =$

12. $\sin\frac{3\pi}{2} =$

13. $\tan\frac{3\pi}{4} =$

14. $\cos\frac{5\pi}{6} =$

15. $\sin\pi =$

16. $\cos\frac{\pi}{3} =$

17. $\sin\frac{4\pi}{3} =$

18. $\tan\frac{2\pi}{3} =$

19. $\cos 2\pi =$

20. $\tan\frac{\pi}{2} =$

21. $\tan\frac{\pi}{3} =$

22. $\cos\frac{7\pi}{4} =$

23. $\tan\frac{7\pi}{6} =$

24. $\sin\frac{\pi}{4} =$

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Review of Functions

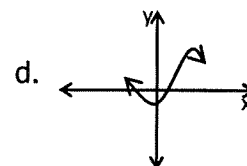
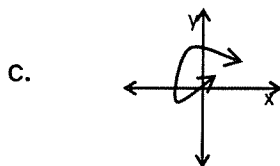
1. What is a function? (Circle the letter.)

- a. It's a relation where for every input there is exactly one output.
- b. It's what you use something for.
- c. It's an algebraic equation
- d. It's a figure in geometry that has exactly 4 sides.

2. Identify the examples of functions. (Circle all letters that apply.)

a. $\{(3, 1), (6, -2), (9, -8), (9, -12)\}$

b. $\{(-4, 2), (0, 0), (2, 2), (3, 7)\}$



e. $5x = 3y + 2$

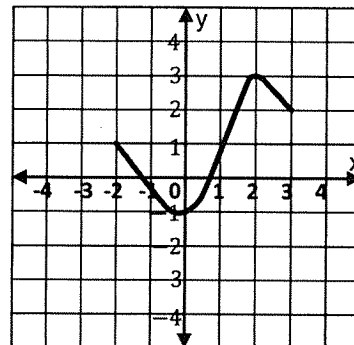
f. $f(x) = x^2 + 8x + 1$

g. $y^2 = x^2 - 4$

h. $f(y) = y^2$

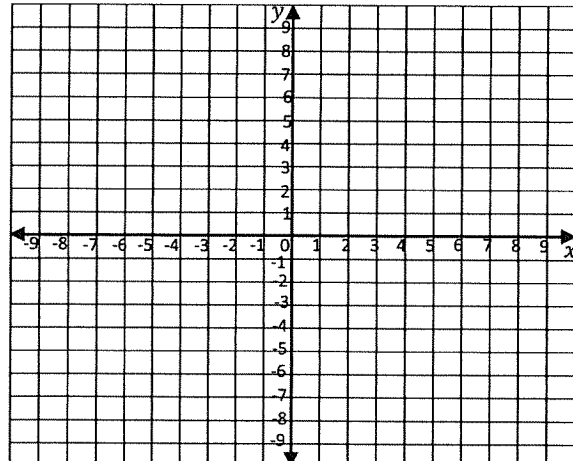
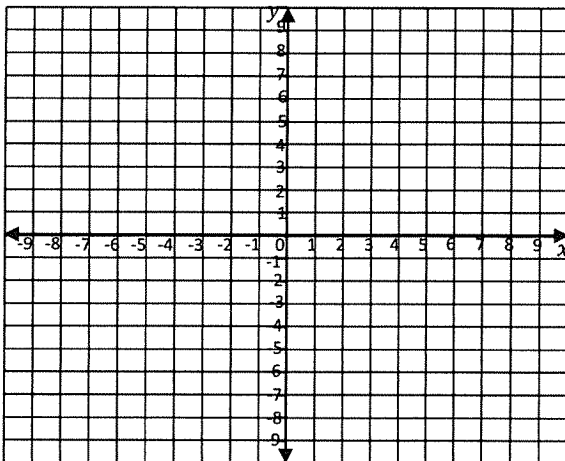
3. Using the graph of $f(x)$, use transformation to graph:

Stretch, move up and down, left and right, flip. I feel like I'm in a yoga class!



a. $g(x) = f(x + 2) + 4$

b. $h(x) = -2f(x) - 1$



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Polynomials and Rational Functions

1. Factor

a. $x^3 - 27$

b. $x^4 - 5x^3 - 4x^2 + 20x$

2. Simplify

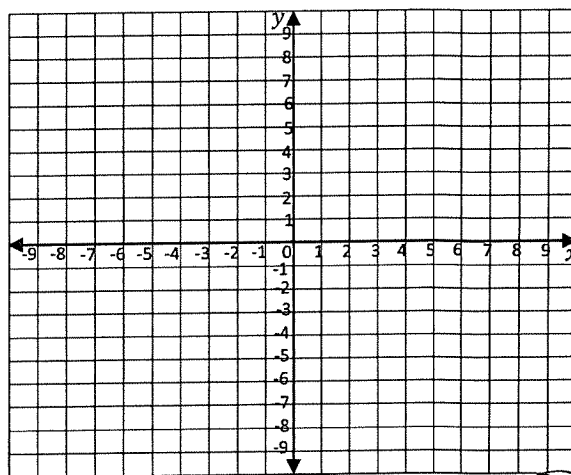
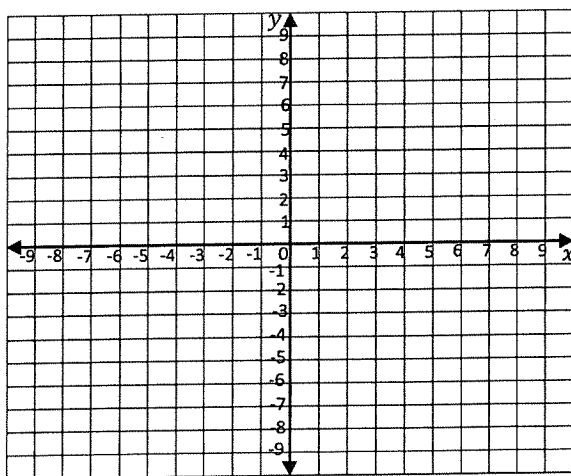
a. $\frac{x+4}{x^2+11x+28}$

b. $\frac{2x^3+8x^2+6x}{x^3-5x^2-24x}$

3. Graph.

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

b. $f(x) = \frac{3x^2-24x}{x^2-10x+16}$



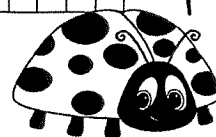
4. Solve for x .

a. $x^3 + 7x^2 - 3x = 21$

b. $\frac{x+1}{6} = \frac{2}{x}$

c. $\frac{8}{x+3} + \frac{10}{x} = 3$

Multiply by
greatest common
factor to get rid of
denominators



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Solve these equations.

1. $2x + 6 = -10$	
2. $x^2 + 5x - 6 = 0$	
3. $2x^2 + 5x - 12 = 0$	
4. $4x^2 + 20x + 25 = 0$	
5. $2x^3 - 7x^2 + 9 = 0$	

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Solve these equations.

1. $x^4 + x^3 - 3x^2 - x + 2 = 0$	
2. $\sqrt{x-1} = x-7$	
3. $3^{2x} = 27^4$	
4. $\ln x = 2$	
5. $e^x = 7$	

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Factor completely.

1. $x^3 + 27$	
2. $(x+2)^3(x-3)^5 + (x-3)^6(x+2)^2$	
3. $3(x-2)^{\frac{3}{2}}(x+1)^2 + 6(x-2)^{\frac{5}{2}}(x+1)^3$	
4. $x^3 - 64$	
5. $5x^2(x+4)^5(x+3)^2 - 10x^3(x+4)^4(x+3)^3$	

Need Help? Look at this website:

<http://www.coolmath.com/precalculus-review-calculus-intro/precalculus-algebra/26-factoring-for-product-rule-01>

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Write the equation of the line.

1. Write the equation of the line that goes through the point $(-2, 3)$ with a slope of $\frac{1}{2}$.	
2. Write the equation of the line parallel to $y = 3x - 7$ that goes through the point $(0, -4)$.	
3. Write the equation of the line that is perpendicular to $y = \frac{3}{2}x + 4$ and goes through the point $(3, -2)$.	
4. Write the equation of the line that goes through the points $(5, -1)$ and $(4, 6)$.	
5. If a line is drawn so that it forms a 30° angle with the x-axis, what is its slope?	

Need Help? Look at this website:

<http://www.coolmath.com/precalculus-review-calculus-intro/precalculus-algebra/02-graphing-equations-of-lines-01>

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Composite and Inverse Functions

Directions: Read each question. Show all work where needed.

1. If $f(x) = 5 - x^2$ and $g(x) = x + 3\sqrt{x}$

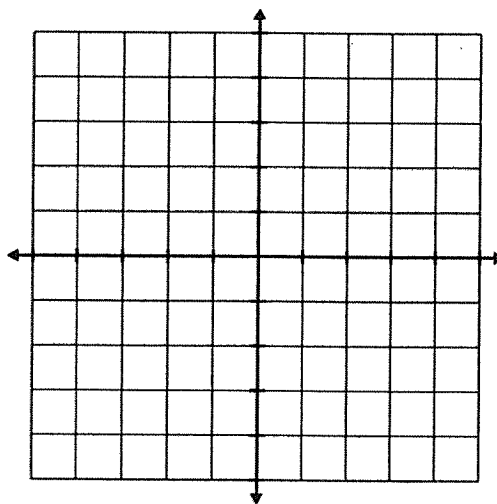
a) Write a formula for $f \circ g$ and $g \circ f$

b) find the domain and range of each.

2. If $f(x) = 3 - 4x$,

a) Find f^{-1}

b) Show that $(f \circ f^{-1})(x) = (f^{-1} \circ f)(x) = x$



c) Graph f and f^{-1} on the same coordinate plane.

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Miscellaneous. Follow the directions in each box.

1. Evaluate without a calculator. A) $9^{\frac{3}{2}}$ B) $32^{\frac{2}{5}}$	
2. If $f(x) = 2x - 3$ and $g(x) = x^2$, find: A) $f(g(2))$ B) $g(f(-1))$	
3. Using that $f(x) = 3x - 5$, find: $\frac{f(x+h) - f(x)}{h}$	
4. Solve the system of equations. $\begin{array}{r} 2x + 3y = 12 \\ -x + 2y = 10 \end{array}$	
5. If y varies directly as x when $x = 2$ then $y = 5$. What is the value of x when $y = 7$?	

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Simplify.

1. $\frac{1}{x+2} + \frac{3}{x-3}$	
2. $2\ln(x+5) - \ln(x+2)$	
3. $\frac{x^2 + 7x + 12}{x-3} \div \frac{x^2 - 16}{x^2 - 9}$	
4. $\frac{\frac{1}{x+2}}{\frac{3}{x^2-4}}$	
5. Word Problem Fun. You are driving across a flat area. In the distance directly in front of you, you notice a mountain. The angle of elevation to the peak is 4° . After you drive 13 miles closer to the mountain, the angle of elevation is 10° . How high is the mountain?	

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Exponentials

1. Simplify:

a. $x^3 \cdot x^5$

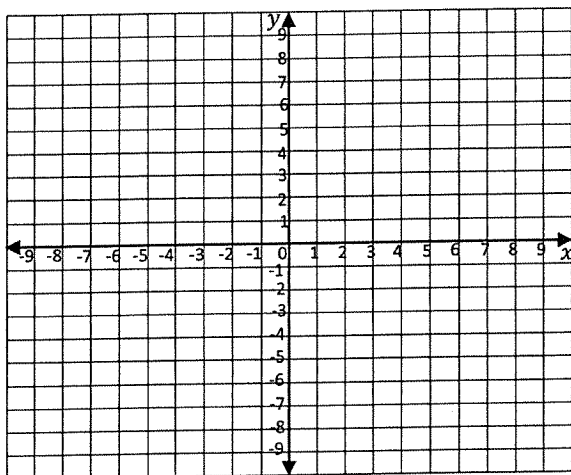
b. $(x^3)^5$

c. $\left(\frac{8x^3y^{-4}}{12x^4y^5}\right)^{-3}$

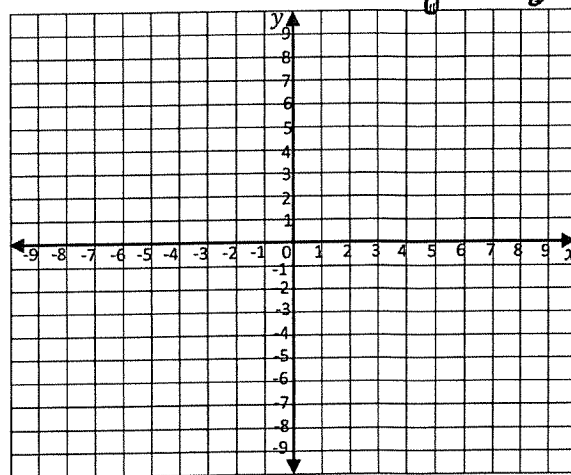
d. $\frac{x^0}{7y^{-3}}$

2. Graph the following:

a. $f(x) = e^{-x}$



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



I'm starting to understand this.



3. Solve for x:

a. $3^{x+1} = 27$

b. $8^x = 2$

c. $4^{3x} = 32$

d. $5^{4x-7} = 25^{5x+4}$

4. If you invest \$500 at 3% interest compounded continuously, how much will you have after 4 years? (You will need a calculator. Use $A = Pe^{rt}$)

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Logarithms

1. Simplify:

a. $\log_8 8$

b. $\log_7 49$

c. $\log_5 1$

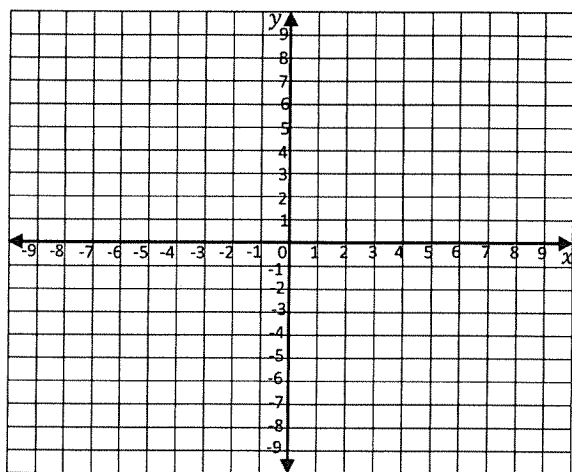
d. $\log_8 2$

e. $\log_9 \frac{1}{3}$

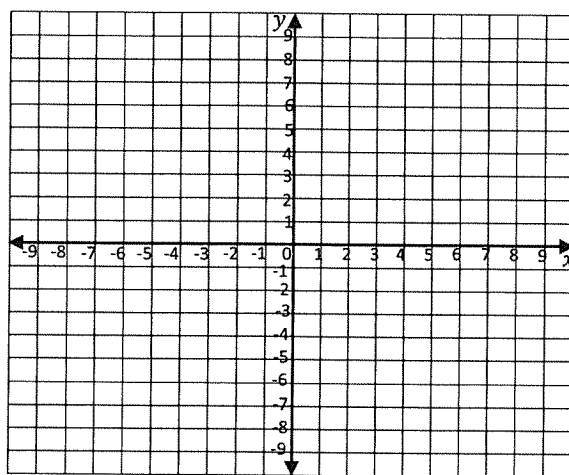
f. $\log_6 6^5$

2. Graph the following:

a. $f(x) = \ln x$



b. $f(x) = \log_2 x + 3$



3. Solve for x:

a. $\log x = 3$

b. $\log_2(x + 1) = 6$

c. $\log_3 x = -1$

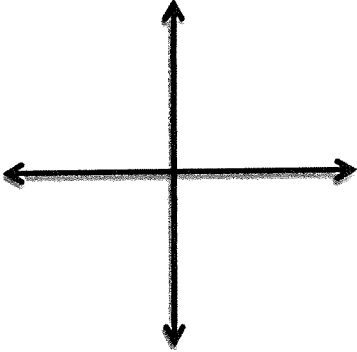
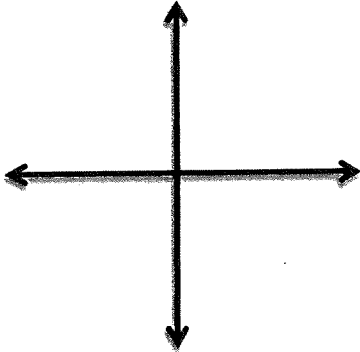
d. $\log_5 x = \frac{1}{2}$

You're flying through!



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Remember the natural log and exponential functions?

1. Evaluate: A) $\ln 1 =$ B) $\ln e =$ C) $e^0 =$ D) What is the approximate value of e?	
2. Draw the natural log function. Label the points where the function intersects the x or y axis. 	3. Draw the exponential function. Label the points where the function intersects the x or y axis. 
4. A) What is the domain of the natural log function? B) What is the domain of the exponential function?	
5. A) What is the range of the natural log function? B) What is the range of the exponential function?	

Do you wonder what you might use calculus for? Watch this Ted Talk:
<https://youtu.be/Idra8rVS1I>

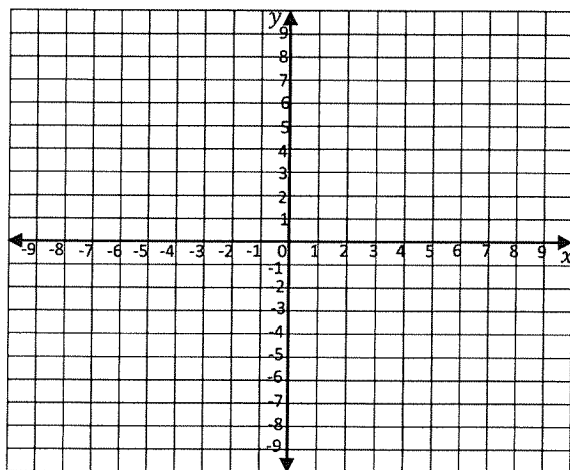
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Geometry Formulas and Analytic Geometry

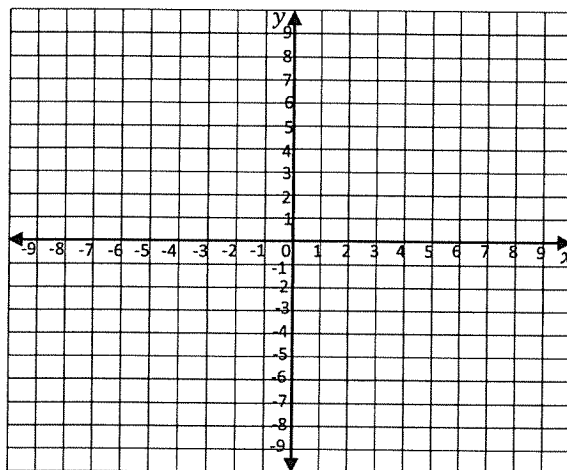
1. If $f(x) = x - 3$ represents the side of a square, find the area of the square in terms of x .
2. If $f(x) = \sqrt{x}$ represents the diameter of a circle, find the area of the semicircle in terms of x .
3. If $f(x) = \sin x - 1$ represents one side of an equilateral triangle, find the area of the triangle in terms of x .

4. Graph

a. $\frac{x^2}{9} + \frac{y^2}{4} = 1$



b. $(x + 1)^2 + (y - 2)^2 = 8$



Jump for
joy. You're
almost done



5. Write the equation of the circle if the radius is 7 and the center is at $(-13, 22)$.

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Sequences and Series

1. Identify the following sequences as arithmetic (A), geometric (G), or neither (N):

a. 7, 11, 16, 22, ...

b. 3, 6, 12, 24, ...

c. 74, 68, 62, 56, ...

d. $6, 2, \frac{2}{3}, \frac{2}{9}, \dots$

2. Find the sum of each:

a. $2(3) + 2(5) + 2(7)$

b. $\sum_{k=2}^6 3k$

c. $\sum_{n=1}^5 2^n$

d. $\sum_{n=0}^{\infty} \left(\frac{1}{3}\right)^n$

3. Use the summation formulas to evaluate the series:

$$\sum_{i=1}^n c = cn$$

$$\sum_{i=1}^n i = \frac{n(n+1)}{2}$$

$$\sum_{i=1}^n i^2 = \frac{n(n+1)(2n+1)}{6}$$

$$\sum_{i=1}^n i^3 = \frac{n^2(n+1)^2}{4}$$

a. $\sum_{i=1}^4 3i^3$

b. $\sum_{i=1}^8 (i^2 - 2i + 7)$

4. (Bonus) If d represents the number of days in calculus class and f represents the amount of fun you will have then

$$\sum_{i=1}^d f =$$



