AP Calculus AB Summer Assignment

Going into AP Calculus, there are certain math skills necessary in order to be successful for the year and ultimately on the AP Exam. This assignment has been designed for you to review/relearn/learn these topics so that you will be ready to learn calculus. I have included websites to refer to if you need help.

Don't fake your way through any of these problems because you will need to understand everything in this very well. If you do not fully understand the topics in this packet, it is possible that you will get calculus problems wrong in the future-not because you do not understand the calculus concept, but because you do not understand the algebra or trig behind it.

Turn in the completed assignment on the first day of class for a daily grade.

Help sites:

Most Algebra Topics: http://www.purplemath.com/modules/index.htm

Trigonometry: http://math.com/homeworkhelp/Trigonometry.html

Khan Academy: https://www.khanacademy.org

◆ **Skill B** Writing an equation of a line in point-slope form

Recall The point-slope form for an equation of a line is $y - y_1 = m(x - x_1)$.

◆ **Example**

Write an equation for the line through $(1, -1)$ and $(-1, 5)$

a. in point-slope form.

b. in slope-intercept form.

◆ **Solution**

a. First find m.

$$m = \frac{\text{difference in } y\text{-values}}{\text{difference in } x\text{-values}} = \frac{-1 - 5}{1 - (-1)} = \frac{-6}{2} = -3$$

Substitute the slope and one of the points into the point-slope equation.

$$y - y_1 = m(x - x_1)$$

$$y - (-1) = -3(x - 1) \qquad \text{Use the point } (1, -1).$$

$$y + 1 = -3(x - 1) \qquad \text{Simplify.}$$

b. Rewrite the equation in the form $y = mx + b$.

$$y + 1 = -3(x - 1)$$

$$y + 1 = -3x + 3 \qquad \text{Distributive Property}$$

$$y = -3x + 2 \qquad \text{Subtract 1 from each side.}$$

Write an equation for each line in point-slope **and** slope-intercept form.

1.

containing $(4, -1)$ and with a slope of $\frac{1}{2}$ ____________________

2.

crossing the x-axis at $x = -3$ and the y-axis at $y = 6$ ____________________

3.

containing the points $(-6, -1)$ and $(3, 2)$ ____________________

◆ Skill D Find the zeros of a polynomial function by factoring

Recall The zeros of a function are the values of x that make y equal to 0.

◆ **Example 1**
Find the zeros of the function $y = (x - 2)(x + 5)$.

◆ **Solution**
Let $y = 0$. Then use the Zero-Product Property to solve for x.

$(x - 2)(x + 5) = 0$
$(x - 2) = 0$ or $(x + 5) = 0$
$x = 2$ or $x = -5$
The zeros of $y = (x - 2)(x + 5)$ are 2 and -5.

Recall A quadratic polynomial can be factored into two binomials.

◆ **Example 2**
Solve the equation $x^2 - x - 6 = 0$.

◆ **Solution**
Since $x^2 - x - 6$ can be factored into $(x + 2)(x - 3)$, you can rewrite $x^2 - x - 6 = 0$ as $(x + 2)(x - 3) = 0$. Solve the equation $(x + 2)(x - 3) = 0$.
$x + 2 = 0$ or $x - 3 = 0$
$x = -2$ or $x = 3$
The solutions to $x^2 - x - 6 = 0$ are -2 and 3.

Solve by factoring.

4. $x^2 - x - 2 = 0$

5. $x^2 + 3x - 4 = 0$

6. $x^2 + 4x + 3 = 0$

7. $x^2 + x - 20 = 0$

8. $x^2 - 36 = 0$

9. $9x^2 - 1 = 0$

◆ **Skill J** Finding the composite of two functions

Recall To write an expression for the composite function $(f \circ g)(x)$, replace each x in the expression for f with the expression defining g. Then simplify the result.

◆ **Example**

Let $f(x) = 5x$ and $g(x) = 2x^2 - 3$. Find $(f \circ g)(2)$ and $(g \circ f)(2)$. Then write expressions for $(f \circ g)(x)$ and $(g \circ f)(x)$.

◆ **Solution**

$(f \circ g)(2)$: $\quad g(2) = 2(2)^2 - 3 = 5 \quad f(g(2)) = f(5) = 5(5) = 25$

Thus, $(f \circ g)(2) = 25$.

$(g \circ f)(2)$: $\quad f(2) = 5(2) = 10 \quad g(f(2)) = g(10) = 2(10)^2 - 3 = 197$

Thus, $(g \circ f)(2) = 197$.

To write expressions for $(f \circ g)(x)$ and $(g \circ f)(x)$, use the variable x instead of a particular number.

$$\begin{aligned} (f \circ g)(x) &= f(g(x)) \\ &= f(2x^2 - 3) \\ &= 5(2x^2 - 3) \\ &= 10x^2 - 15 \end{aligned} \qquad \begin{aligned} (g \circ f)(x) &= g(f(x)) \\ &= g(5x) \\ &= 2(5x)^2 - 3 \\ &= 50x^2 - 3 \end{aligned}$$

Let $f(x) = x^2 - 1$, $g(x) = 3x$, and $h(x) = 5 - x$. Find each composite function.

10. $(f°g)(x)$

11. $(g°g)(x)$

12. $(g°h)(4)$

◆ **Skill M** Using logarithms to solve exponential equations

Recall The common logarithm, $\log_{10} x$, is usually written as $\log x$.

◆ **Example**

Solve each equation.

a. $3^x = 81$ **b.** $5^x = 75$ **c.** $7^{x+1} = 150$

◆ **Solution**

a. $3^x = 81$

Since 81 is a power of 3, use powers of 3.

$3^x = 3^4$

$x = 4$ *One-to-One Property of Exponential Functions*

b. $5^x = 75$

Since 75 is **not** a power of 5, use logarithms to solve this equation.

$\log 5^x = \log 75$

$x \log 5 = \log 75$ *Power Property of Logarithms*

$$x = \frac{\log 75}{\log 5}$$

$x \approx 2.68$

Check: $5^{2.68} \approx 75$

c. $7^{x+1} = 150$

$\log 7^{x+1} = \log 150$

$(x+1)\log 7 = \log 150$

$$x + 1 = \frac{\log 150}{\log 7}$$

$$x = \frac{\log 150}{\log 7} - 1$$

$x \approx 1.57$

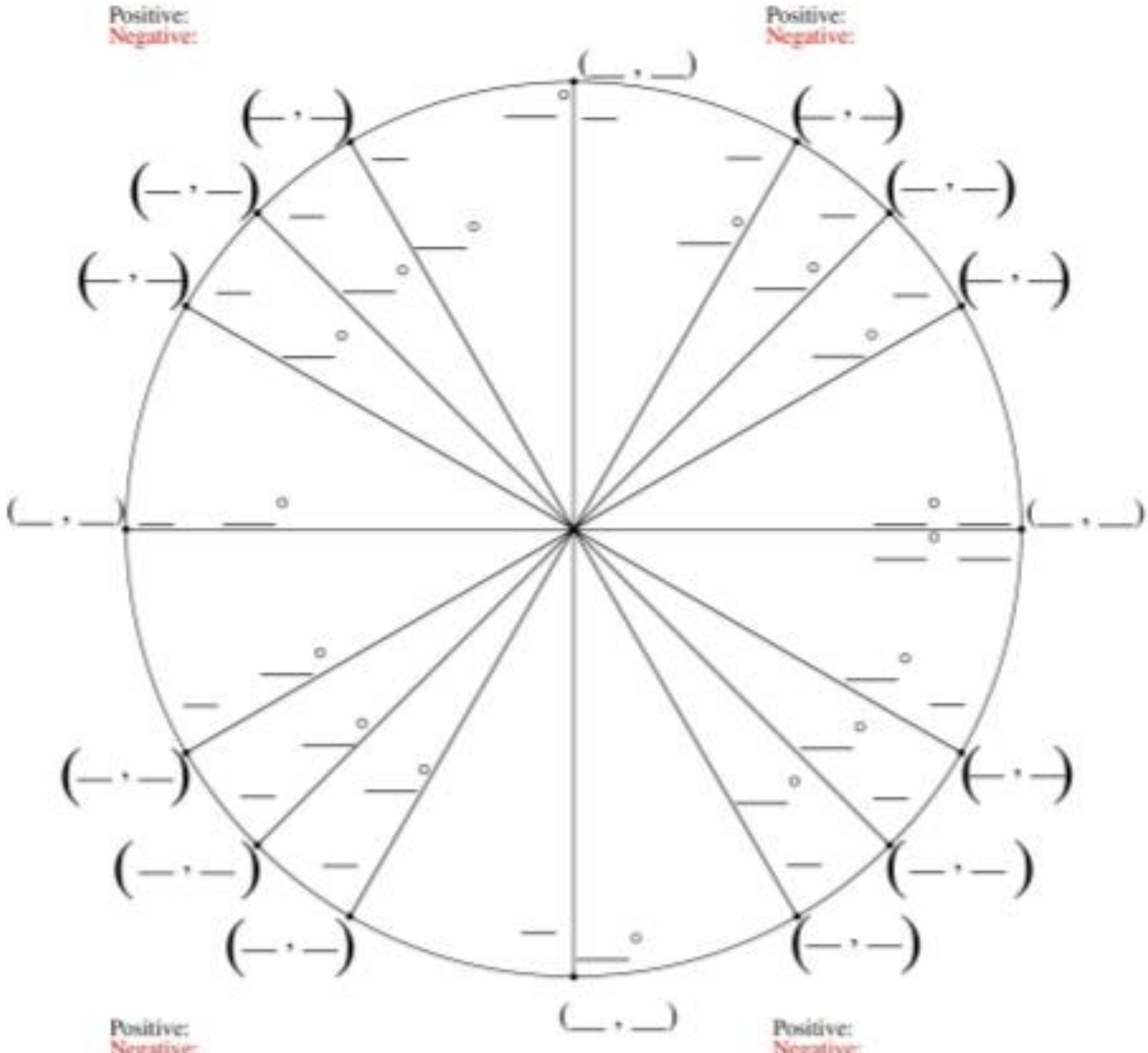
Solve each equation. Round your answers to the nearest hundredth.

13. $7^x = 80$

14. $6^{2x-7} = 216$

15. $3e^x = 120$

Fill in The Unit Circle



Evaluate each expression. Give exact answers.

16. $sin\frac{3\pi}{4}$

17. $\cos\left(-\frac{7\pi}{6}\right)$

18. $tan\left(-\frac{\pi}{4}\right)$

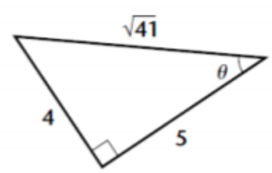
19. $sin\pi$

◆**Skill Y** Finding the trigonometric functions of an acute angle

Recall The hypotenuse is the longest side in a right triangle and is opposite the right angle.

◆ **Example**

Refer to the triangle shown at right and give values for $\sin\theta$, $\cos\theta$, $\tan\theta$, $\cot\theta$, $\sec\theta$, and $\csc\theta$.



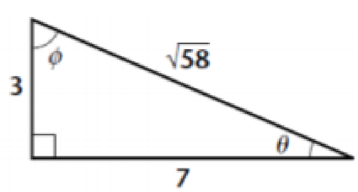
◆ **Solution**

The hypotenuse (hyp.) has a length of $\sqrt{41}$.
The leg opposite (opp.) θ has a length of 4.
The leg adjacent (adj.) to θ has a length of 5.

$\sin\theta = \frac{\text{opp.}}{\text{hyp.}} = \frac{4}{\sqrt{41}}$ $\quad \csc\theta = \frac{\text{hyp.}}{\text{opp.}} = \frac{\sqrt{41}}{4}$ $\quad \cos\theta = \frac{\text{adj.}}{\text{hyp.}} = \frac{5}{\sqrt{41}}$

$\sec\theta = \frac{\text{hyp.}}{\text{adj.}} = \frac{\sqrt{41}}{5}$ $\quad \tan\theta = \frac{\text{opp.}}{\text{adj.}} = \frac{4}{5}$ $\quad \cot\theta = \frac{\text{adj.}}{\text{opp.}} = \frac{5}{4}$

Refer to the triangle to find each value. Give exact answers.



20. $sec\theta$

21. $cot\theta$

22. $csc\emptyset$