Summer Assignment 2013 **Name:** _____
AP Calculus Readiness Test

What you need to know:

I put the following problems together after reflecting upon this past year and the problem areas some of my students ran into. Calculus is NOT that hard. Where many students struggle is not with the Calculus of many problems but with the Algebra and Pre-Calculus skills that they have since forgotten. If you can come into Calculus next year confident that you can do all the problems in this packet and other problems of this type you will be off to a great start. What comes next will then be dependent on our collective efforts. If you do not look at this packet except for the 5 minutes it would take you to copy a friend or write random gibberish then you will most definitely NOT be off to a good start and should probably reconsider this course as an option for you.

So, I will NOT be collecting and grading this packet. This is an AP course and there will be things you are expected to do. For instance, I expect you to come to class every day with the proper materials to work but I will not give you credit for bringing a pencil. I also expect you to seek extra help when struggling but I will not give you extra credit for staying after. So as this goes I expect you to complete this packet. I will not grade it BUT you will have a quiz during the first week of class on the material covered in this packet.

Since you will be graded on your ability to do these problems in September then I suggest that you wait until the middle of August to complete these problems. This way they will be fresh in your head.

If you have any questions over the summer either on this packet or about the course in general, please don't hesitate to email me. **Bergeron.kl@easthartford.org**

Well, I think that's all for now. I look forward to getting to know all of you!!! Enjoy your summer!!!

A. Know well the properties of exponents including negative and rational exponents. Here are some examples of problems you should be able to complete with ease. Number 6 may pose a challenge. A hint is given.

Simplify the following:

1. $\dfrac{\dfrac{21-7x}{x+3}}{\dfrac{x^2-3x}{2x+3}} =$

2. $\dfrac{x^{4b+1}}{x^{2-b}} =$

3. If $\log w = \dfrac{1}{5}\log x - \log y$ then w =?

4. $\sqrt[4]{3}\cdot\sqrt[5]{3} =$

5. $(27a^{-3}b^6c^3)^{\frac{1}{3}}$

6. $\dfrac{1}{\sqrt{x}-\sqrt{x+1}}$ (HINT: multiply by the conjugate of the denominator)

B. Be able to graph and evaluate the functions below without the use of a calculator.

1. $y = e^x$ **2.** $y = \ln x$ **3.** $f(x) = e^x$. Find $f(0)$ & $f(1)$

4. $f(x) = \ln x$ Find $f(0), f(e), f(e^2), f(e^9)$.

C. Be able to find relative/local minimums and relative/local maximum values of functions on an open and closed interval using a graphing calculator. Also describe intervals of increase and decrease, where the function is positive or negative, and the zeros of the function. Again all of this should be done using a graphing calculator. Here are a few for you to try. Please write answers in interval notation when necessary.

1. $f(x) = -(x-2)^2(x+4)^3$

Find the relative max on [0, 9] _____

Find the relative min on [-5, 5]. _____

For what values of x is $f(x)$ positive? _____

For what values of x is $f(x)$ increasing? _____

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

Find the relative max on [0, 9]. _____

Find the relative min(s) on [0, 9]. _____

For what values of x is $f(x)$ negative? _____

For what values of x is $f(x)$ decreasing? _____

3. $f(x) = x^4 + 3x^3 - 13x^2 + 51x - 36$

Find where $f(x) = 0$. _____

For what values of x is $f(x)$ negative? _____

D. FACTOR, FACTOR, FACTOR!!! Be able to factor quadratics with ease. Be able to factor polynomial functions by synthetic, long division and with the use of a graphing calculator. Be able to solve equations using factoring methods. Factor the expressions or solve the equations below by any method.

1. $x^2 + 5x = -6$

2. $3(x-6)^2(3x-4) - 6(x-6)^3$

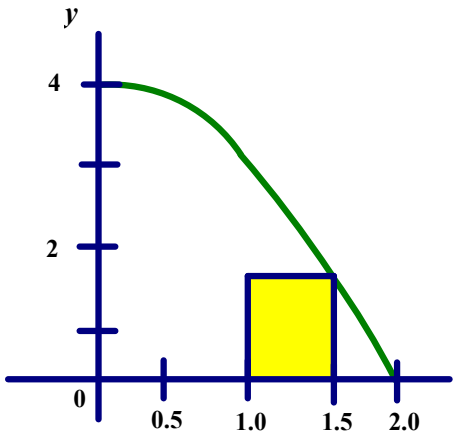
3. $\dfrac{x^2 - 5x - 24}{x^2 - 3x - 18}$

4. $8x^3 - 1$

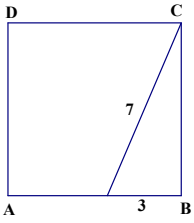
5. $2e^2(3x+1)^3(x-4) - 10e(3x+1)^2$

E. Geometry Skills. Be able to find areas, perimeters and volumes of two and three dimensional figures. Be able to solve for variables when given measurements as expressions rather than pure values. A few examples of what I am referring two are shown.

1. A portion of the graph of $y = 4 - x^2$ is shown at the right. What is the area of the shaded rectangle?



2. Find the area of the square ABCD.



3. Find the volume of a sphere with radius $r = 3$.

4. Given a right triangle ABC with right angle A and AC= $3x$, BC=$5x$ and a Perimeter of 84, find x.

5. Sketch the area of the region that is bounded by the graph of $y = x + 3$, the x-axis and the vertical lines $x = 3$ and $x = 5$.

F. Write Equations of Lines in POINT-SLOPE FORM!!!!!!! Here is a couple to try. There are specific instances where it is more logical to use slope-intercept and an example of that is given below also. For this one problem, explain why it is easier to use slope-intercept form.

1. $(1, 2)$ and $(2, -3)$ **2.** $(2, -3)$ and $(0, 2)$ **3.** $(-4, 2)$ and $(-5, 7)$

G. Be able to find and graph inverse functions. Also be able to verify if two functions are inverses of each other. Be able to evaluate composite functions.

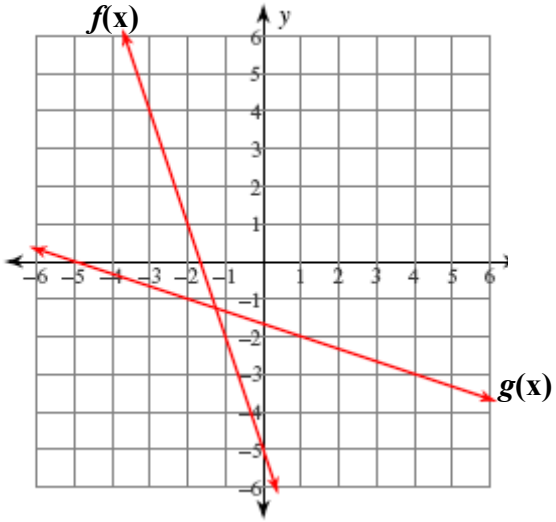
1. Are $f(x) = x^3 - 1$ and $g(x) = \sqrt[3]{x+1}$ inverses? **2.** Write the equation of the inverse of $f(x) = -\frac{2}{3}x + 5$

3. If $f(x) = x^2 - 1$ and $g(x) = \frac{x+1}{x-1}$. Find $f(g(2))$, $g(f(2))$ and $f(f(2))$

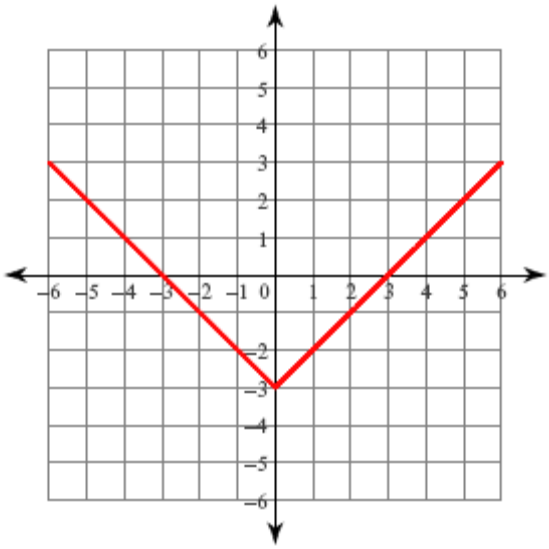
H. And now what you have all been waiting for……. KNOW (and by know I mean memorize) the Unit Circle and equations of circles. Be able to evaluate the sine, cosine and tangent functions for radians on the unit circle.

I. Use the graphs below to answer the following questions.

1. Find $f(-2)$ and $g(4)$. Also find the slope of $f(x)$ and $g(x)$.



2. The graph of f is shown below. Find $f(-2)$ and $f(4)$. Also find the slope of $f(x)$ at $x = -4$ and at $x = 5$



J. Be able to solve complex equations using your graphing calculator.

1. How many solutions does $\cos x = x^2$ have?

2. Solve $2^{4x-1} = \ln(3x+6)$

Other Key Points to recall:

- The absolute Value function is defined as $|a| = \begin{cases} -a & \text{if } a < 0 \\ a & \text{if } a \geq 0 \end{cases}$

- Odd function: A function f is odd if $f(-x) = -f(x)$, in which case the graph is symmetric about the origin.

- Even function: A function f is even if $f(-x) = f(x)$, in which case the graph is symmetric about the y-axis.

- There are four types of intervals with endpoints a and b:

$$(a, b), \quad [a, b], \quad [a, b), \quad (a, b]$$

- The distance d between (x_1, y_1) and (x_2, y_2) is $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$.