Herndon High School
700 Bennett Street
Herndon, VA 20170

Dear AP Calculus Student,

We hope you are excited for the year of Calculus! When we asked our past students to explain in simple words what Calculus is all about, we received many different answers BUT there was a common theme – most students found Calculus to be the first math course where the emphasis was on conceptual understanding as opposed to learning methods to solve particular type of problem. Many students said that this class changed the way they approached math and that it taught them to think differently. As exciting as it was for us to read those answers, they don't tell you what the class actually covers. And so our favorite answer was "Calculus is the study of change". We could not put it in better words. But you might still be wondering, what does that actually mean? If we had to summarize the curriculum, we would say that you will spend this year learning about derivatives (for the first semester) and integrals (for the second semester). You don't need to know what those things are (yet) but these are the tools that allow us to study "continuous change" – how fast things change, how to predict change, and how to use information about change to understand the systems themselves.

In some ways, 'Calculus is basically just very advanced algebra and geometry. In one sense, it's not even a new subject — it takes the ordinary rules of algebra and geometry and tweaks them so that they can be used on more complicated problems', problems that deals with constant change. For example, it was back in Algebra 1 that you learned how to find the slope of a line but how to find the slope of a curve which is constantly changing? So 'traditional' math tells us how to find the slope of a line, and Calculus tells us how to find the slope of a curve. 'Traditional' math tells us how to find the length of a rope pulled taut, but Calculus tells us how to find the length of a curved rope. 'Traditional' math tells us how to find the area of a flat, rectangular roof, but Calculus tells us how to find the area of a curved dome-shaped roof. 'Traditional' math tells us how to calculate the distance travelled when you go at constant speed, but Calculus will deal with speed that is constantly changing (like in real life!).

How does Calculus manage to pull this off? Imagine a curve like this:

If you were to zoom in a few times, each part of the curve would look kind of like a line, wouldn't it? And if "a few times" wasn't enough, you could zoom in more. And more. And more. In fact, you could zoom in nearly an infinite number of times until the curve became enough like a line that you could treat it that way. "What makes calculus such a fantastic achievement is that it actually zooms in infinitely. In fact, everything you do in calculus involves infinity in one way or another, because if something is constantly changing, it's changing infinitely often from each infinitesimal moment to the next." (taken from http://media.wiley.com/product_data/excerpt/84/07645249/0764524984.pdf)

This process – doing something an infinite number of times until the problem becomes figure-out-able – is the foundation of Calculus.

In order to be successful in this course you need the proper foundation. (i.e., knowledge of algebra, geometry, trigonometry, analytic geometry, and elementary functions). You will have to be very familiar with the basic families of functions and all their representations. You need to recognize their graphs and determine their behaviors. You need to be able to interpret numerical values given by formulas, graphs, and tables. You need to know all the rules needed to manipulate algebraic expressions and solve equations that include polynomials, rationals, exponentials, logs, and trigs. You will also need to be able to carry out various computational tasks with efficiency and accuracy (know your fractions!). Finally, you need to be able to know how and when to use calculator (but nothing more than what you learned in Pre-Calculus class).

This is a rigorous college course. The curriculum and pace of the course is intense, and all enrolled students are expected to take the AP exam. Since this is a *college class* you can expect to spend approximately 1-2 hours completing homework or studying for every hour that you are in class learning. Each test and quiz that is given is *cumulative* and will be graded as per the College Board guidelines. Therefore, this course will be **challenging and demanding**.

If the above two paragraphs are a bit intense, we meant that 😊 But guess what? **You made it through Algebra, Geometry, and Trigs. And you are here, sill reading! And that means you are ready**. And plus you still have some time before our first lesson to brush on you precalculus skills. This packet will help you with that. **Complete it in its entirety or just parts where you need more practice. Show ALL of your work/process and be neat and organized (**a skill of its own and so important in higher level math courses where much of the focus is not on solving but on reasoning and communicating your solution using proper mathematical notation**). Use a calculator ONLY for the ending Calculator section.**

Due: This summer assignment will not be collected or graded. HOWEVER, you should consider this assignment as a self-assessment of sorts. Use it to prepare yourself for the upcoming year. Remember, that the skills needed to complete this assignment are skills that we expect you to possess prior to the first day of school. Therefore, if you are unable to complete any of the problems, we suggest that you start studying and ask questions! Note that upon returning to school in the Fall, you will have a non-retakeable assessment of these skills (no calculator allowed). If you fail the assessment, the recommendation will be made for you to switch to a lower level class.

Help with Packet: There is a lot of help on the internet. There will also be an optional help session (details TBD but for sure during the week before school year starts – email with details will be sent to all registered students). This is a help session to work on problems you are having difficulty with, not a session in which to do your packet. Complete as much of the packet as possible before attending the session.

Feel free to contact us with any questions or concerns that you or your parents may have. Have a restful summer and be ready for an exciting time in AP Calculus next year.

Sincerely,

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SKILLS NEEDED FOR CALCULUS **<u>(if needed, have a cheat sheet ready to use in class!)</u>**

I. Graphing and Functions

- *A. Lines (intercepts, slopes, write equations using point-slope and slope intercept, parallel, perpendicular, distance and midpoint formulas)
- *B. Functions (definition, notation, domain, range, inverse, composition)
- *C. Basic shapes and transformations of the following functions (absolute value, rational, root, higher order curves, log, ln, exponential, trigonometric. piece-wise, inverse functions)
- D. Tests for symmetry (even, odd)

II. Algebra:

- *A. Factoring (GCF, trinomials, difference of squares and cubes, sum of cubes, grouping)
- *B. Simplifying rational expressions
- *C. Exponents (operations with integer, fractional, and negative exponents)
- *D. Logs (evaluating logs with and without calculator, laws of logarithms)
- *E. Solving algebraic equations & inequalities (linear, quadratic, rational, radical, absolute value, exponentials, logs)
- F. Simultaneous equations
- G. Long division of polynomials

III. Geometry

- A. Pythagorean Theorem
- B. Area Formulas (Circle, polygons, surface area of solids)
- C. Volume formulas
- D. Similar Triangles
- E. Midpoint and Distance formulas
- *F. Equation of the line in point-slope form
- *G. Equation of horizontal line, vertical line
- *H. Parallel lines and Perpendicular lines (slopes of)

* IV. Functions from algebra perspective

- A. Linear transformations and linear combinations of functions
- *B. Function compositions
- *C. Inverses
- D. All common function families – parent function, transformations, properties of functions (domain, range, asymptotes, end behaviors, etc), knowing how to analyze the function
- E. Piece-wise functions

* V. Trigonometry

- *A. Unit Circle (definition of functions, angles in radians and degrees)
- B. Use of Pythagorean Identities and formulas to simplify expressions and prove identities
- *C. Solve equations
- *D. Inverse Trigonometric functions
- E. Right triangle trigonometry
- *F. Graphs

VI. Calculator Commands used in Pre-Calculus

* A solid working foundation in these areas is very important.

Trigonometric Functions

Trigonometric Identities that you **MUST memorize**		
Reciprocal Identities	**Quotient Identities**	**Pythagorean Identities**
$\sin x = \frac{1}{\csc x}$ $\csc x = \frac{1}{\sin x}$ $\cos x = \frac{1}{\sec x}$ $\sec x = \frac{1}{\cos x}$ $\tan x = \frac{1}{\cot x}$ $\cot x = \frac{1}{\tan x}$	$\tan x = \frac{\sin x}{\cos x}$ $\cot x = \frac{\cos x}{\sin x}$	$\sin^2 x + \cos^2 x = 1$ $\tan^2 x + 1 = \sec^2 x$ $1 + \cot^2 x = \csc^2 x$

Trigonometric Identities that you **MUST know (memorize ow, better yet, be able to derive)**	
Co-Function Identities	**Odd/Even Identities**
$\sin\left(\frac{\pi}{2}-\theta\right)=\cos\theta$ $\cos\left(\frac{\pi}{2}-\theta\right)=\sin\theta$ $\csc\left(\frac{\pi}{2}-\theta\right)=\sec\theta$ $\sec\left(\frac{\pi}{2}-\theta\right)=\csc\theta$ $\tan\left(\frac{\pi}{2}-\theta\right)=\cot\theta$ $\cot\left(\frac{\pi}{2}-\theta\right)=\tan\theta$	Odd $\sin(-\theta)=-\sin\theta$ $\csc(-\theta)=-\csc\theta$ $\tan(-\theta)=-\tan\theta$ $\cot(-\theta)=-\cot\theta$ Even $\cos(-\theta)=\cos\theta$ $\sec(-\theta)=\sec\theta$

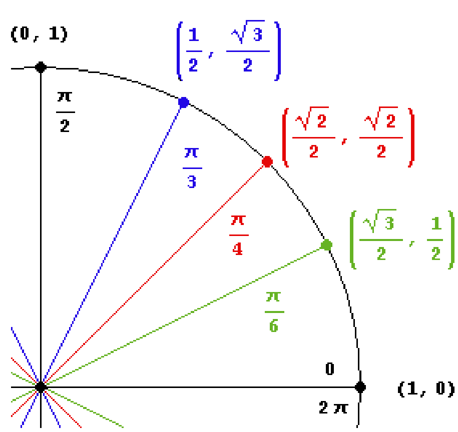
Trigonometric Identities that you **MUST be familiar with** (aka. recognize and know where to find)	
Double Angle Identities	***Half Angle Identities***
$\sin 2x = 2\sin x\cos x$ $\cos 2x = \cos^2 x - \sin^2 x$ $\cos 2x = 2\cos^2 x - 1$ $\cos 2x = 1 - 2\sin^2 x$	$\sin^2 x = \frac{1-\cos 2x}{2}$ $\cos^2 x = \frac{1+\cos 2x}{2}$

The Radian Measures and Coordinates **MUST** be **memorized**

$$\sin\theta = \frac{y}{r} = y - coordinate$$

$$\cos\theta = \frac{x}{r} = x - coordinate$$

$$\tan\theta = \frac{y}{x} = \frac{y\text{−}coordinate}{x\text{−}coordinate}$$

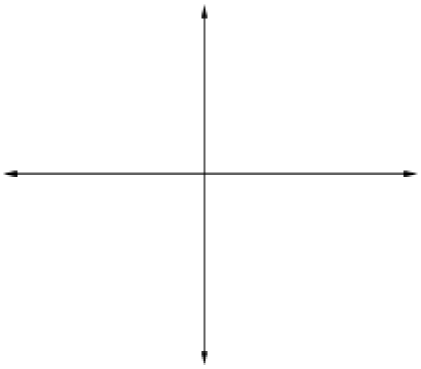


Calculus AB Review Packet: 2020-21 **Name___________________________**

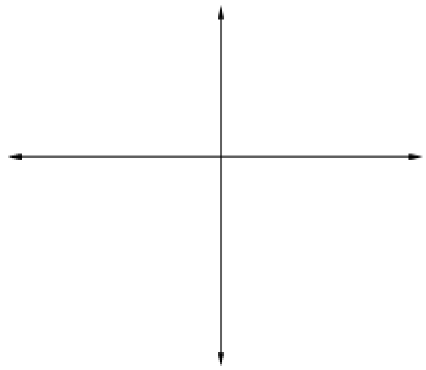
Directions: Work the following problems, showing all related work neatly on separate paper. No work = no credit!

Part 1 (NO CALCULATOR) For each function, sketch the graph and specify domain, range, whether odd/even/neither

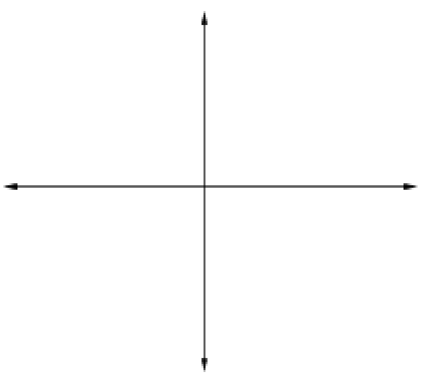
1: y = x



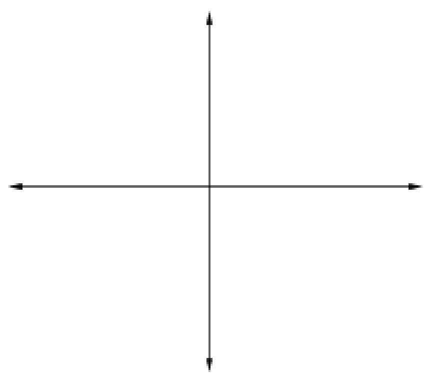
2: y = c (c is a constant)



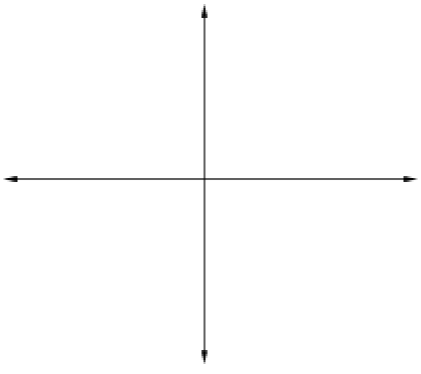
3: $y = x^2$



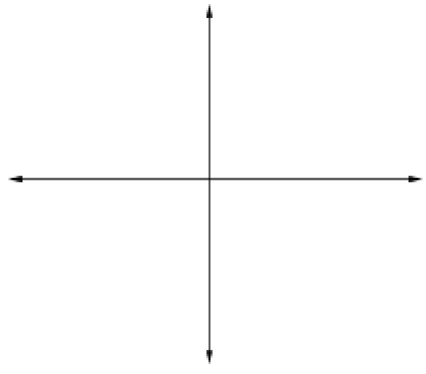
4: $y = x^3$



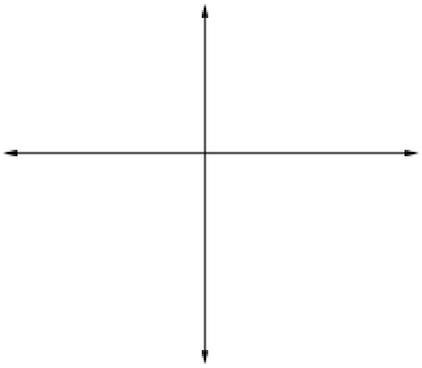
5: y = |x|



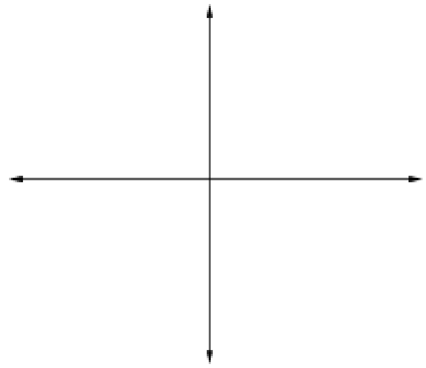
6. $y = \begin{cases} \sqrt{25 - x^2}, & if\ x < 0 \\ \frac{x^2-25}{x-5}, & if\ \ x \geq 0\ and\ x \neq 5 \\ 0, & if\ \ x = 5 \end{cases}$



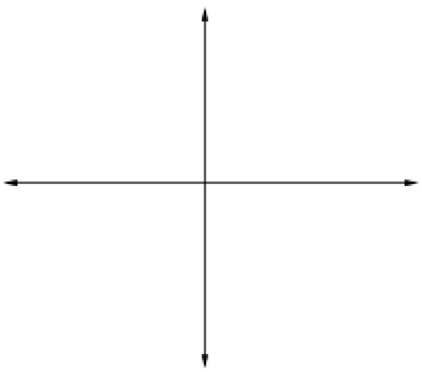
7: $y = \sqrt{x}$



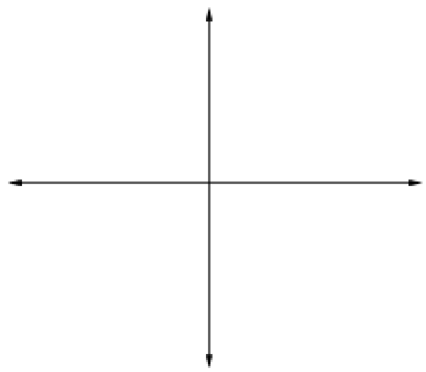
8: $y = \sqrt[3]{x}$



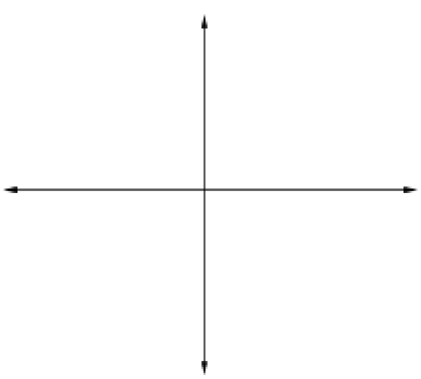
9: $y = e^x$



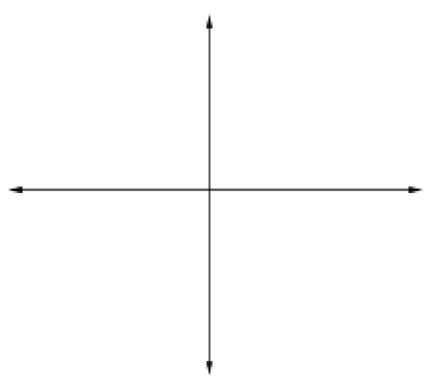
10: $y = \ln x$



11. $y = \frac{1}{x}$



12. $y = \frac{1}{x^2}$



<u>Part 2</u> (NO CALCULATOR)

1. Factor completely

a. $(x-5)^2 - y^2$

b. $x^3 - 64$

c. $3x^3 - 6x^2 - 45x$

d. $2x(4x+3)^3 - 5(4x+3)^4$

e. $100x^2 - 9y^2$

f. $9x^2 + 3x - 3xy - y$

g. $5x^3y^2 + 25x^2y^3 + 10x^3y^4$

h. $6m^2 - 17m - 14$

i. $64x^6 - 1$ (Hint: first use dif of squares, then sum & diff of cubes)

j. $42x^4 + 35x^2 - 28$

k. $15x^{5/2} - 2x^{\frac{3}{2}} - 24x^{\frac{1}{2}}$ (Hint: Factor out GCF $x^{\frac{1}{2}}$ first)

l. $x^{-1} - 3x^{-2} + 2x^{-3}$ (Hint: Factor out GCF x^{-3} first)

2. Evaluate when k = -4, m = -3 and r = 5

a. $2k^2 - r^2$

b. $-5(3r - 2m)$

c. $\dfrac{4k^2 + r}{m - 6}$

3. Solve for all solutions (real and complex)

a. $(x-5)^2 = 9$

b. $x^3 - 125 = 0$

c. $3x^3 - 6x^2 - 45x = 0$

4. Find the quotient and remainder when $x^3 - 6x^2 - 5x - 7$ is divided by $x - 5$

5. Solve for x: $3[4x - 2(3x-1)] = 7 - 9x$

6. Solve for y': $2xy' + 2y + 1 = 12 - y'$

7. Solve for x and graph each solution set on a number line:

a) $-4 < \frac{4}{3}x - 2 < 2$

b) $|x+2| \leq 5$

c) $|3k+1| > 8$

8. Simplify and write answers with only positive exponents. Assume all variables are non-zero real numbers.

a) $\dfrac{(2y)^5\ y^2}{y^{-8}y^3}$

b) $\dfrac{(2x)^{-4}(x^{-1})^{-3}}{3(x^{-5})^{-2}}$

c) $\left[\dfrac{x^{-3/4} \cdot y^{1/4}}{x \cdot x^{-5/4}}\right]^{-1}$

9. Multiply for part a and divide for part b as indicated:

a. $\frac{x^2-7x+10}{x^2-1} \times \frac{x+1}{x-5}$

b. $\frac{x^4+2x^2-3x^2}{x^2-6x+5} \div \frac{x^3-9x}{x^2+x-30}$

10. Add or subtract:

a. $\frac{2}{x-1} - \frac{1}{1-x}$

b. $\frac{6}{x^2-9} + \frac{1}{2x-6}$

11. Simplify:

a. $\frac{\frac{1}{x+3}+\frac{1}{x}}{x}$

b. $\frac{x^2+7x+12}{x^2-16}$

c. $\frac{\frac{5}{x-2}-\frac{2}{x}}{\frac{1}{x}+\frac{3}{x-2}}$

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

12. Solve for x

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

b. $\frac{2x-3}{5} - \frac{6x+1}{2} = \frac{-3}{10}$

13. Solve for y: $x = \frac{5y-3}{2y+1}$

14. Rationalize denominator: $\frac{3-x}{1-\sqrt{x-2}}$

15. Solve each inequality - give your solution in interval notation

a. $x^2 + 2x < 15$

b. $2x + 3 < 7$

c. $(x+3)^2 > 4$

d. $\frac{x+5}{x-3} \leq 0$

e. $3x^3 - 14x^2 - 5x \leq 0$

f. $x < \frac{1}{x}$

g. $\frac{x^2-9}{x+1} \geq 0$

h. $\frac{1}{x-1} + \frac{4}{x-6} > 0$

h. $x^2 < 4$

i. $|2x+1| < \frac{1}{4}$

16. Solve the system algebraically, then check with calculator (graph and find intersection points)

a. $x - y + 1 = 0$
$y - x^2 = -5$

b. $x^2 - 4x + 3 = y$
$-x^2 + 6x - 9 = y$

17. Simplify

a) $\sqrt{125x^5}$

b) $(216a^6b^7)^{1/3}$

c) $2\sqrt{75} - 5\sqrt{243} + 3\sqrt{108}$

d) $5x^3(2x)^4(3x^{-2})$

18. Simplify (remember….no calculators!!)

a) $81^{-3/4}$

b) $x^{-\frac{5}{3}}(x^2 + x^{-\frac{1}{3}})$

c) $\left(\frac{4}{9}\right)^{-\frac{3}{2}}$

19. Simplify without calculator

a. $\log_4 \frac{1}{16} =$

b. $3\log_3 3 - \frac{3}{4}\log_3 81 + \frac{1}{3}\log_3 \frac{1}{27} =$

c. $\log_9 27 =$

d. ln e =

e. $\ln 1 =$

f. $\ln e^2 =$

g. $\log_w w^{45} =$

20. Solve each for *x:*

a. $\frac{1}{4} = 8^{x+3}$

b. $27^{x+1} = 9^{2x-4}$

c. $e^{3x} = 8$

21. Solve for x:

a. $\log_3 9 = x$

b. $\log_x 8 = \frac{3}{2}$

c. $\log_a x = 3$

d. ln e^x = 4

e. $\log_{x+2} 16 = 4$

f. $\log_3 x + \log_3 (x-2) = 1$

g. $ln(x+2) = 5$

h. $\log x^2 - \log 100 = \log 1$

Part 3 (NO CALCULATOR)

1. Given points S (- 3, 4) and T (6, - 7) Find the following:
   a. the midpoint of *ST*
   b. distance between points S and T
   c. the slope of the line through S and T
   d. the equation of the line that goes through S & T

2. Given the line 3*x* - 5*y* = 7, find the **point-slope form** of the equation of a line through (3, 1) that is

   a. parallel to the given line

   b. perpendicular to the given line

3. Find the equation of the line parallel to the y axis for which f(4) = 6.

Part 4 (NO CALCULATOR)

1. Given $f(x) = 5 - 3x^2$, find $f(-1)$

2. Given the *f (x)* = 2 *x* + 5, find each

   a. *f (x* + 3*)*

   b. *f (f (x))*

   c. *f (x* + 1*)* - *f (x)*

3. Given $f(x) = 2x - 1$, $g(x) = 3x^2$,$f'(x) = 2$, and $g^{'}(x) = 6x$, find the following

a. $(g(f(x)) \cdot g'(x)$ b. $f(x)g'(x) + f'(x)g(x)$ c. $\frac{g(x)f^{'}(x) - f(x)g^{'}(x)}{(g(x))^2}$

4. Use the table to evaluate the following

x	f(x)	g(x)	f ‘(x)
−5	3	5	2
−3	−3	1	3
−1	−5	3	1
1	−1	−3	0
3	5	−1	-1
5	1	−5	-2

a. $f(-5) - g(3) =$

b. $f(5) \times f'(-3) =$

c. $g(f(1)) \times f'(1) =$

5. Given $f(x) = \begin{cases} -|x+1| & (-\infty, -1) \\ 2 & (-1, 2) \\ \sqrt{x+2} + 4 & [2, \infty) \end{cases}$, evaluate

a. $f(-1) =$

b. $f(0) =$

c. $f(f(1)) =$

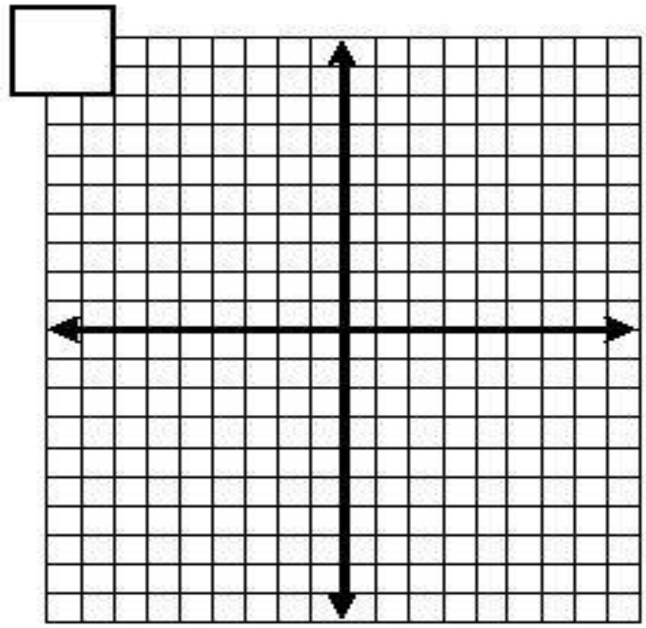
d. $\frac{f(5) - f(3)}{5-3} =$

6. If $f(x) = \frac{x^2}{2} - ln\, x$, then $f(e) - f(1) =$

7. If $f(x) = 3\sqrt{x}$ and $f(k) - f(4) = 1$, then *k* =

8. If $V = \frac{1}{3}\pi r^2 h$ and $r = \frac{1}{4}h$ then $V(h) =$

12. Given $y = \frac{x^2+7x+12}{x^2-16}$ find the following:



a. x intercepts _______________

b. y intercept _______________

c. equation of vertical asymptote (if any) _____________

d. equation of horizontal asymptote (if any) ___________

e. location of hole(s) in the graph (if any) ____________

f. sketch the graph showing all key points ____________

g. domain _______________ and range _______________

h. When is $f(x) = 0$?_____________ $f(x) > 0$? _______________ $f(x) < 0$? _______________

13. Given $f(x) = e^x - 3$, find the following:

Domain:__________ Range:___________ Asymptote(s):________

When is $f(x) = 0$? When is $f(x) > 0$? When is $f(x) < 0$?

14. Given $f(x) = 1 + ln(x - 2)$, find the following:

Domain:__________ Range:___________ Asymptote(s):________

When is $f(x) = 0$? When is $f(x) > 0$? When is $f(x) < 0$?

15. Determine if the following functions are even, odd, or neither. Justify your answer.

Even: f(x) = f(-x) Odd: f(-x) = -f(x)

a) $f(x) = x^3 + 3x$ b) $f(x) = x^4 + 6x^2 + 3$ c) $f(x) = \dfrac{x^3 - x}{x^2}$

16. Determine which type of symmetry the following functions have.

Symmetric to y axis: replace x with -x and relation remains the same.
Symmetric to x axis: replace y with -y and relation remains the same.
Origin symmetry: replace x with -x, y with -y and the relation is equivalent.

a) $x = y^2 + 1$ b) $y = x^4 + x^2$ c) $y = \sin x$

17. For each of the following, identify the values of x for which f(x) positive, negative, is zero, undefined

a. $f(x) = \frac{3x^2-5x-2}{x+4}$

$f(x) = 0$___________

$f(x) > 0$___________ $f(x) < 0$____________

$f(x)$ is undefined __________

b. $g(x) = 4x^2 + 4x - 3$

$f(x) = 0$___________

$f(x) > 0$___________ $f(x) < 0$____________

$f(x)$ is undefined __________

c. $h(x) = \frac{2x-6}{x^2+3x-4}$

$f(x) = 0$___________

$f(x) > 0$___________ $f(x) < 0$____________

$f(x)$ is undefined __________

d. $p(x) = (x-4)(2x-1)(3x+5)^2$

$f(x) = 0$___________

$f(x) > 0$___________ $f(x) < 0$____________

$f(x)$ is undefined __________

18. Let $f(x) = x^2 + 3x - 2$, $g(x) = 4x - 3$, $h(x) = \ln x$, $w(x) = \sqrt{x - 4}$

a. $g^{-1}(x) =$ b. $h^{-1}(x) =$ c. for $x \geq 4$, $w^{-1}(x) =$

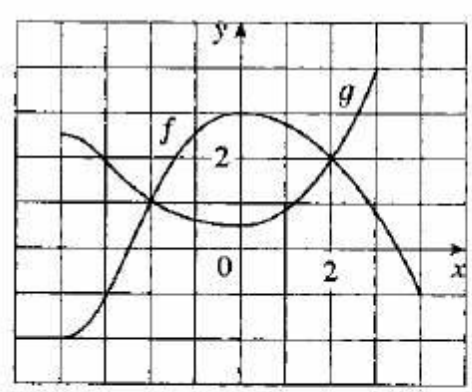
d. $f(g(x)) =$ e. $h(g(f((1))) =$ f. $f(a + h) =$

19. Let $f(x) = 2x$, $g(x) = -x$, $h(x) = 4$

b. $f \circ g\ (x) =$ b. $f \circ g \circ h\ (x) =$

20. Let $s(x) = \sqrt{4 - x}$ and $t(x) = x^2$. Find the domain of $s(t(x))$

21. The graphs of f an g are given.



a. Find values of $f(-4) =$ and $g(3) =$

b. For what value of x is $f(x) = g(x)$?

c. Estimate the solution for equation $f(x)$ =-1

d. On what interval is f(x) decreasing?

e. State the domain and range of f

f. State the domain and range of g

Part 5 **(NO CALCULATOR)**

1. Find the exact value of the following using the unit circle.

a. $cos\left(\frac{2\pi}{3}\right)$ b. $tan\left(\frac{\pi}{4}\right)$ c. $sin\left(\frac{7\pi}{6}\right)$

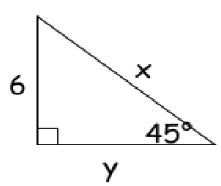
d. $tan\left(\frac{3\pi}{2}\right)$ e. $cos\left(\frac{-\pi}{6}\right)$ f. $cos\left(\frac{\pi}{2}\right)$

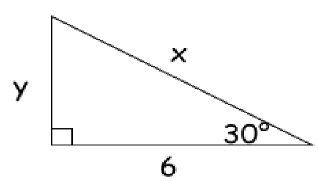
g. $tan\left(\frac{\pi}{3}\right)$ h. $sin\left(\frac{\pi}{4}\right)$ i. $sin\left(\frac{-\pi}{3}\right)$

WATCH OUT for RANGE RESTRICTIONS ON THESE

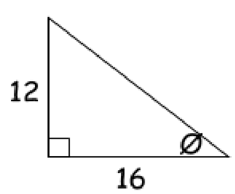
j. $arcsin(-1)$ k. $arctan(1)$ l. $arccos(\frac{-1}{2})$

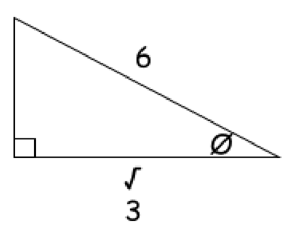
2. Find the missing sides in each





3. For each triangle, find the indicated:





$\sin\theta =$

$\cos\theta =$

$\tan\theta =$

$\sin\theta =$

$\cos\theta =$

$\tan\theta =$

4. Solve the equations

a. $\cos^2 x = \cos x + 2,\ 0 \le x \le 2\pi$

b. $2\sin(2x) = \sqrt{3},\ 0 \le x \le 2\pi$

c. $\cos^2 x + \sin x\ + 1 = 0,\ 0 \le x \le 2\pi$

5. State the domain, range and fundamental period for each function:

a. $\mathrm{y} = \cos x$

b. $\mathrm{y} = \sin x$

c. $\mathrm{y} = \tan x$

d. $\mathrm{y} = \arcsin x$

e. $\mathrm{y} = \cos^{-1} x$

f. $\mathrm{y} = \arctan x$

Part 6: Graphing Calculator Practice and Review

Be familiar with the calculator commands to find value, root, minimum, maximum, and intersect.
You may need to zoom in on areas of your graph. All answers in calculus need to be written to 3 decimal places!

1. Use the graphing calculator to answer the following questions about the following function:

   $f(x) = 2x^4 - 11x^3 - x^2 + 30x$

   a. Find all roots.

   b. Find all local maxima.

   c. Find all local minima.

   d. Find the following values: f(-1) = ___ f(2) = ___ f(0) = ___ f(.125) = ___

3. a. Solve for *x*: $2x^3 + 3x = 1$

   b. Use value of *x* from (a) to evaluate $f(x) = \frac{x^4}{2} + \frac{3x^2}{2}$

4. Find where $x \cos x > 0$ on the interval [0, 5]

6. Find all x-coordinates $-2\pi \leq x \leq 2\pi$ where $x + b = x + b \sin x$

7. Find all **points** of intersection of $f(x) = x^2$ and $g(x) = 2^x$ (Include **at least** 3 decimal places in your answer.)

8. Find all intervals where $2x^2 - 10x + e^x < 0$. (Again, include **at least** 3 decimal places in your answer.)

9. On the interval (-4, 1), at what value(s) of *x* does $f(x) = ln(x^4 + 5x^3 + x^2 - 7x + 28)$ change from negative to positive?

10. If $f(t) = \frac{5e^{-3t}+2}{t \sin t}$, then $f(2) =$

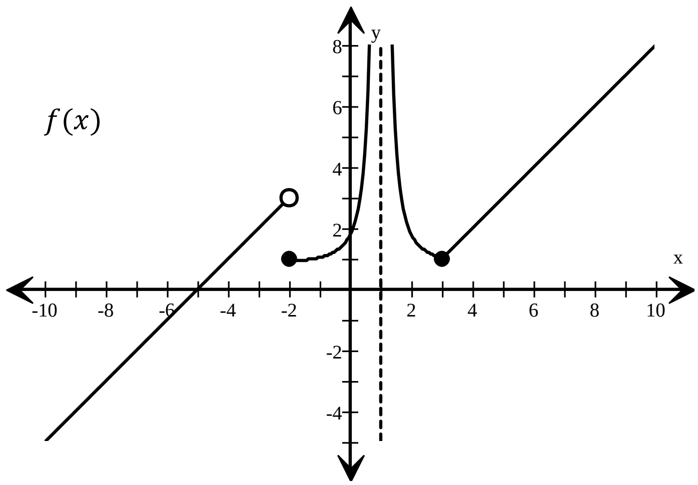
BONUS: <u>Part 7</u> LIMITS!!!

Don't worry if you have not gotten to Limits in Pre-Calculus. These two sites have great short tutorials that will get you started: http://www.calculus-help.com/tutorials

OR http://www.khanacademy.org/math/calculus/limits_topic/limits_tutorial/v/introduction-to-limits--hd

After watching, see if you can complete the following problems relating to limits. But know that we will review Limits again at the beginning of the year!

Use the graph to answer the questions.



1. $f(-2) =$

2. $\lim_{x\to -2^+} f(x) =$

3. $\lim_{x\to -2^-} f(x) =$

4. $\lim_{x\to -2} f(x) =$

5. $\lim_{x\to 1^+} f(x) =$

6. $\lim_{x\to 1^-} f(x) =$

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

8. $f(1) =$

9. $\lim_{x\to -5} f(x) =$

10. $\lim_{x\to 3^+} f(x) =$

11. $\lim_{x\to 3^-} f(x) =$

12. $\lim_{x\to 3} f(x) =$

Find the value of each limit, if it exists.

13. $\lim_{x\to 2} \frac{x-5}{x-2}$

14. $\lim_{x\to 3} \frac{x^2-2x-3}{x^2-3x}$

15. $\lim_{x\to \infty} \frac{x^2}{4x^2-7}$

16. $\lim_{x\to \infty} e^x + 2$

17. $\lim_{x\to -1} \frac{1-2x}{\sqrt{x+6}}$

18. $\lim_{x\to \infty} \frac{x}{1+x^2}$

19. $\lim_{x\to -3} 10$

20. $\lim_{x\to \infty} \frac{3x^3+x^2}{x-4}$

21. $\lim_{x\to -\infty} e^x + 2$