Name ______________________________

Students Entering Academic Calculus, Summer Packet

When you go into calculus, we assume you have certain mathematical skills that were taught to you in previous years. If you do not have these skills, you will find that you will consistently get problems incorrectly next year, even though you understand the calculus concepts. It is frustrating for students when they are tripped up by the algebra and not the calculus. This summer packet is intended for you to brush up and possibly relearn these topics.
Answer all questions without a calculator!!

Spread out your work during the whole summer, since you need these skills to be relatively fresh in your mind in the fall. Also, don't fake your way through these problems; instead, visit the websites suggested below. The whole packet will take you about 10 hours to complete.
We expect you to try hard at reviewing this material, to look things up, watch video lessons, and then complete this practice.
Answers will be shared on the first and second day of school. On those days you will have a chance to ask questions, complete some of the problems, and then hand it in [you may attach extra paper to show your work].

http://www.khanacademy.com
http://www.purplemath.com/modules/index.htm
http://www.hippocampus.org/?select-textbook=19
http://tutorial.math.lamar.edu/Classes/Alg/Alg.aspx

This practice is divided into four sections:

1. Simplify expressions
2. Evaluate functions
3. Solve equations
4. Basic functions and operations

1. Simplify each expression

a. $\dfrac{x^2 - 4x}{x^2 - 7x + 12}$

b. $2\ln(x + 3) - \ln(x)$

c. $\dfrac{x^3}{x^{-5}}$

d. $\dfrac{4 - x}{x^2 - 16}$

e. $\dfrac{x}{\sqrt{x}}$

f. $\dfrac{2}{\sqrt{3}}$

g. $\dfrac{5}{x} - \dfrac{2}{x}$

h. $\dfrac{a^{-1}}{a^{-2}\sqrt{a}}$

i. $\tan x \cos x$

j. $2\ln\left(\sqrt{1 - x}\right)$

k. $\sin^2 x + \cos^2 x$

2. Evaluate each quantity and write in simplest form

Fill in this chart with the missing radian/degree measure:

Radians	$\frac{\pi}{6}$		$\frac{2\pi}{5}$				$\frac{3\pi}{4}$	$\frac{5\pi}{6}$	$\frac{4\pi}{3}$
Degrees		240°		180°	120°	225°			

Radians	$\frac{\pi}{4}$		$\frac{7\pi}{3}$				$\frac{5\pi}{4}$	$\frac{5\pi}{12}$	$\frac{11\pi}{6}$
Degrees		135°		90°	270°	300°			

Find the <u>exact value</u> of the following

$sin\left(\frac{\pi}{2}\right)$ $\quad$ $cos\left(\frac{\pi}{2}\right)$ $\quad$ $tan\left(\frac{\pi}{2}\right)$

$sin\left(\frac{\pi}{3}\right)$ $\quad$ $cos\left(\frac{\pi}{6}\right)$ $\quad$ $tan\left(-\frac{3\pi}{4}\right)$

$sin\left(\frac{4\pi}{3}\right)$ $\quad$ $cot\left(\frac{\pi}{3}\right)$ $\quad$ $tan\left(\frac{2\pi}{3}\right)$

$cos\left(-\frac{\pi}{3}\right)$ $\quad$ $cos\left(\frac{7\pi}{4}\right)$ $\quad$ $sin\left(\frac{5\pi}{2}\right)$

$ln\, e^7$ $\quad$ $ln\, 1$ $\quad$ $27^{\frac{2}{3}}$

$\sqrt{\frac{49}{121}}$ $\quad$ $\sqrt[3]{8}$ $\quad$ $16^{-\frac{1}{2}}$

e^0 $\quad$ $ln\left(\sqrt{e}\right)$ $\quad$ $1^{4.2}$

3. Solve each equation/inequalityfor *x*(give exact values only; solve trig equations on $[0, 2\pi]$)

a. $3x + 2 = 8$

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

c. $x^2 - 3x + 2 = 0$

d. $x^2 - 6x + 9 = 0$

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

f. $x^2 + 9 = 0$

g. $\frac{1}{x} + x = 4$

h. $\frac{2}{x + 1} = \frac{x - 2}{2}$

i. $\sqrt{x - 1} - 5 = 0$

j. $3cosx - 1 = 2$

k. $\frac{1}{3} = 3^{2x + 2}$

l. $tanx(2cosx - 1) = 0$

m. $5^{x + 1} = 25$

n. $ln(x + 1) = 2$

o. $ln\left(e^x\right) = 4$

p. $lnx + 2lnx = 0$

q. $e^{2x - 5} = 1$

r. $\log_3 x = \log_3 4 - \log_3 5$

s. $\sqrt{x + 3} = x - 9$

t. $\frac{x^4 - 1}{x^3} = 0$

u. $(x + 3)(x - 3) > 0$

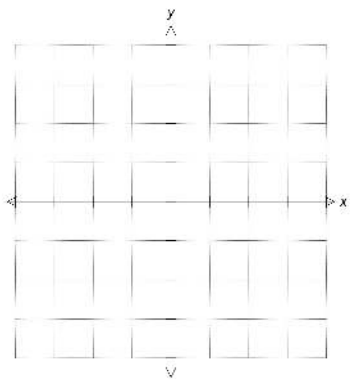
v. $\frac{x + 2}{x} \geq 0$

4. Basic functions: graphs and operations

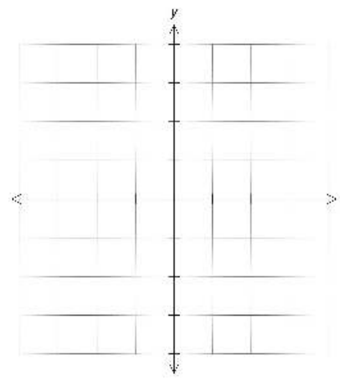
Calculus is a lot easier when you are familiar with several basic functions.
For each function listed below, you should be able to quickly and accurately:

- sketch its graph
- identify domain, range, intercepts, asymptotes…
- perform basic transformations (shifts, stretches, reflections)

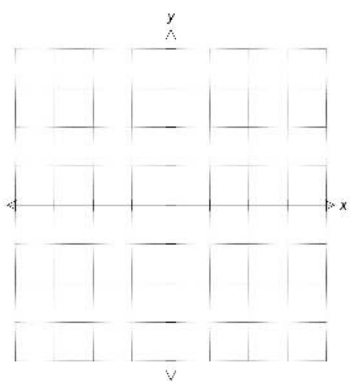
a. $y = x^2$



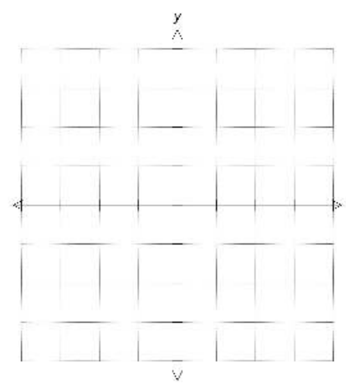
b. $y = x^3$



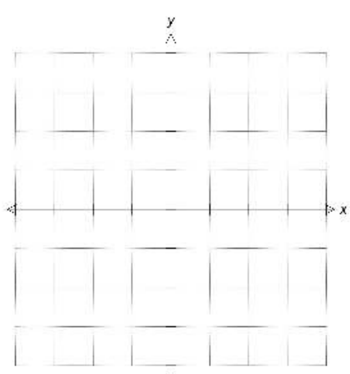
c. $y = \sqrt{x}$



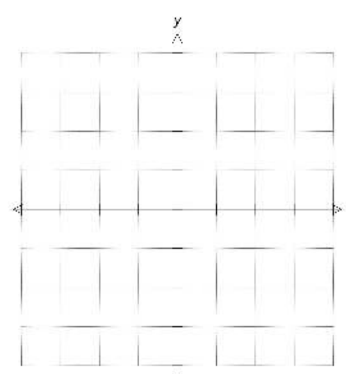
d. $y = \sqrt[3]{x}$



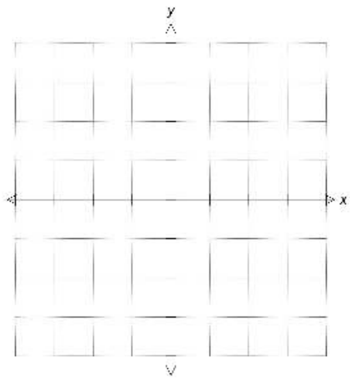
e. $y = e^x$



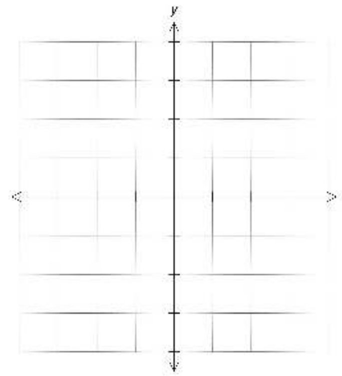
f. $y = e^{-x}$



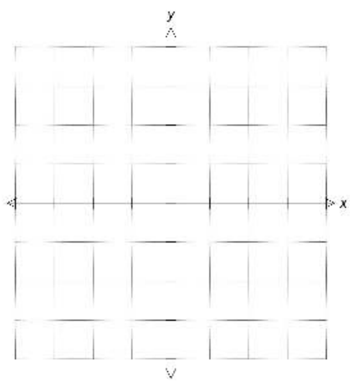
g. $y = lnx$



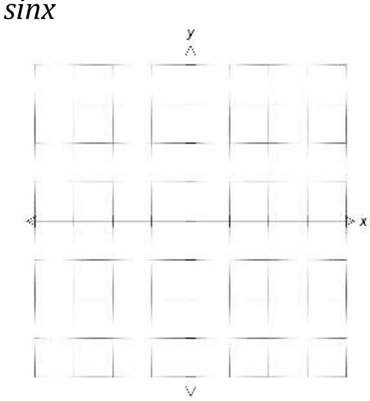
h. $y = \dfrac{1}{x}$



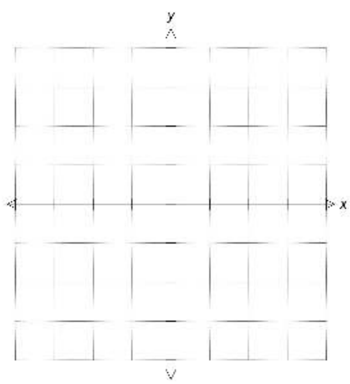
i. $y = |x|$



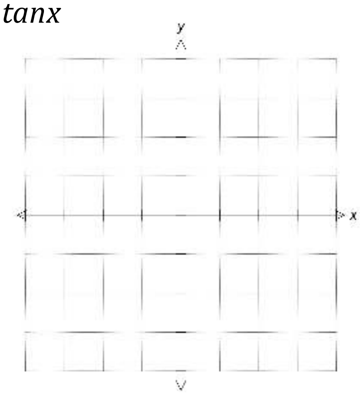
j. $y = sinx$



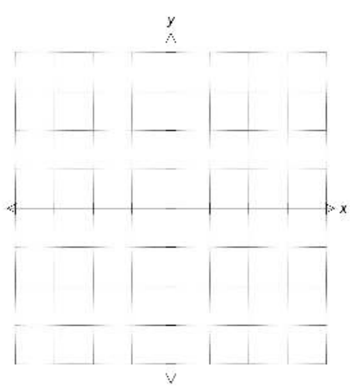
k. $y = cosx$



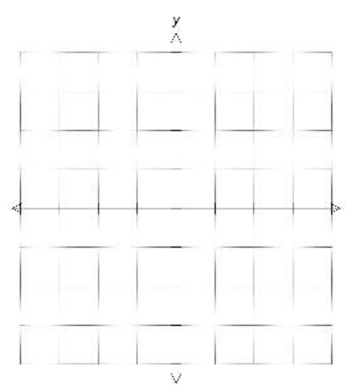
l. $y = tanx$



m. $y = \begin{cases} sinx & x < 0 \\ x^2 & x \geq 0 \end{cases}$



n. $y = \begin{cases} x + 1 & x < -1 \\ 2 - x & -1 < x \end{cases}$



Operations with functions

o. Find the inverse of each function. Is $f^{-1}(x)$ a function? Why? Why not?

$f(x) = \sqrt{x+1}$ $\quad$ $f(x) = 5x - 2$ $\quad$ $f(x) = x^2 + 1$

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p. Given $f(x) = \sqrt{x+1}$ *and* $g(x) = 3x + 1$ evaluate and simplify the following:

$g(a + b) =$

$f(x - 3) =$

$f(g(x)) =$

$g(f(x)) =$

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q. Linear functions: find the equation of a line given each condition

- The line with slope 2 passing through (-3,1)
- The line parallel to $3x - y + 1 = 0$ and passing through the origin
- The line that forms a 45° angle with the x-axis and passes through (1,2)
- The line that is perpendicular to $y = \frac{1}{4}x + 1$ and is passing through (3,0)
- The line passing through points (-1,1) and (3,-1)
- The line with slope 2 that forms a triangle of area 12 with the positive x- and y-axis

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r. Find the domain of each function

$y = \sqrt{x+5}$ $\quad$ $y = \frac{3x}{x-1}$ $\quad$ $y = 2^x$

$y = ln(x + 2)$ $\quad$ $y = tan(x)$ $\quad$ $y = cos(\pi x)$

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s. Find the equation of each vertical and horizontal asymptote (if any)

$f(x) = \dfrac{x + 2}{2x - 1}$

$f(x) = \dfrac{3x}{x^2 + x - 2}$

$f(x) = \dfrac{x^3 + 5x^2}{x^2 + 9}$

$f(x) = \dfrac{x + 4}{x^3 - 4x}$

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t. Describe (and graph) each transformation when compared to the parent graph:

$y = \sqrt{x - 2} + 3$

$y = sin(2x)$

$y = \left| x^2 - 4 \right|$

$y = \dfrac{1}{x + 3}$

$y = (x - 5)^2 - 2$

$y = ln(-x)$

---------------------------------- **The End** ----------------------------------