Dear Parents and Students,

As educators, we realize that students experience a learning loss in mathematics if not academically engaged. Consequently, at the beginning of each school year we are forced to spend an inordinate amount of time reviewing concepts from the previous math course. Our solution for this problem is to expedite the review process in the form of a summer math packet.

The purpose of these packets is to have students review concepts taught during the school year so that there is no retention loss in key concept areas and to better prepare the students for the upcoming year in mathematics.

We ask that over the course of the summer, you download and print the summer math packet that corresponds to your child(ren). If your child is entering the 9th grade then you will download the "Incoming Geometry Students" packet. All work is to be turned in the first full day of school.

As teachers, we will still be reviewing, but not reteaching.

Should you have any questions regarding the math packet please feel free to contact:

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Thank you for your understanding and cooperation. Enjoy the summer! We look forward to working with you and your child during the upcoming 2016-2017 academic term.

7th graders	"Incoming Pre-Algebra Students"
8th graders	"Incoming Algebra 1 Students"
9th graders	"Incoming Geometry Students"
10th graders	"Incoming Algebra 2 with Trig Students"
11th graders	"Incoming Pre-Calculus Students"
12th graders	"Incoming Calculus Students"

Calculus
Summer Review Packet

Calculus:

Calculus is a challenging and rigorous field of mathematics and introduces concepts never learned in other math courses thus far. It requires students to be able to recall many skills at a moment's notice and assumes that certain, basic mathematical concepts have been mastered. This summer packet is designed to help insure that you have a proper background before beginning Calculus in the fall.

Make use of Google.com, khanacademy.org, and wolfrmalpha.com to search for answers to specific questions you might have.

Calculus Summer Packet

Work the following problems in the space provided. Show all necessary work.

Algebra

Exponents.

1) $\dfrac{(8x^3yz)^{1/3}(2x)^3}{4x^{1/3}\left(yz^{2/3}\right)^{-1}}$

Factor Completely.

2) $9x^2 + 3x - 3xy - y$

3) $64x^6 - 1$

4) $42x^4 + 35x^2 - 28$

5) $15x^{5/2} - 2x^{3/2} - 24x^{1/2}$

Rationalize the denominator / numerator.

6) $\dfrac{x}{1-\sqrt{x-2}}$

7) $\dfrac{\sqrt{x+1}+1}{x}$

Simplify the rational expression.

8) $\dfrac{(x+1)^3(x-2)+3(x+1)^2}{(x+1)^4}$

Solve algebraic equations and inequalities.
Use synthetic division to help factor the following, state all factors and roots.

9) $p(x) = x^3 + 4x^2 + x - 6$	10) $p(x) = 6x^3 - 17x^2 - 16x + 7$
11) $p(x) = 25x^3 + 50x^2 - 9x - 18$	12) $p(x) = x^4 - x^3 - 2x - 4$
13) *Explain* why $\frac{3}{2}$ cannot be a root of $4x^5 + cx^3 - dx + 5 = 0$, where c and d are integers.	14)) *Explain* why $x^4 + 7x^2 + x - 5 = 0$ must have a root in the interval [0, 1], ($0 \le x \le 1$)

Solve.

15) $(x+3)^2 > 4$	16) $\frac{x+5}{x-3} \le 0$	17) $x^3 + 2x^2 - 3x \le 0$
18) $\frac{x^2-9}{x+1} \ge 0$	19) $0 < \lvert x-2 \rvert < 8$	20) $\lvert 5x-1 \rvert > 9$

Solve the system.

21) $x-y+1=0$ $y-x^2=-5$	22) $x^2-4x+3=y$ $-x^2+6x-9=y$

Graphing and Functions

Linear Graphs *- Write the equation of the line described below.*

23) Passes through the point (2, -1) and has slope -1/3.	24) Passes through the point (4, -3) and is perpendicular to $3x+2y=4$.	25) Passes through (-1, -2) and Is parallel to $y=\frac{3}{5}x-1$.

Conic Sections *- Write the equation in standard form and identify the conic.*

26) $x = 4y^2 + 8y - 3$	27) $x^2+y^2-4x+2y-4=0$
28) $4x^2-16x+3y^2+24y+52=0$	29) $x^2-4y^2+2x+24y-19=0$

Functions

Find the domain and range of the following.
domain restrictions - denominator ≠ 0, argument of a log or ln > 0, radicand of even index must be ≥ 0
range restrictions- reasoning, if all else fails, use graphing calculator

30) $y = \frac{3}{x-2}$	31) $y = \log(x - 3)$
32) $y = x^4 + x^2 + 2$	33) $y = \sqrt{2x-3}$
34) $y = \lvert x - 5 \rvert$	35) Given f(x) below, graph over the domain [-3, 3]. What is the range? $f(x) = \begin{cases} x & \text{if } x \geq 0 \\ 1 & \text{if } -1 \leq x < 0 \\ x-2 & \text{if } x < -1 \end{cases}$

Compositions and Inverses *- Find the compositions and inverses as indicated below.*

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

36) $g^{-1}(x)$	37) $h^{-1}(x)$	38) $w^{-1}(x)$, for $x \geq 4$	39) f(g(x))
40) h(g(f(1)))	41) g(h(x))	42) g(w(x))	43) Does $y = 3x^2 - 9$ have an inverse function? Explain your answer.

Basic Shapes of Curves:

Sketch the graphs on separate paper. You may use your graphing calculator to verify the graph, but you should be able to graph the following by knowledge of the shape of the curve, by plotting a few points, and by your knowledge of transformations.

44) $y = \sqrt{x}$	45) $y = \ln x$	46) $y = \lvert x - 2 \rvert$
47) $y = \frac{1}{x}$	48) $y = \frac{1}{x-2}$	49) $y = \frac{x}{x^2-4}$
50) $y = y = e^x$	51) $y = 3^x$	52) $f(x) = \begin{cases} \sqrt{25-x^2} & \text{if } x < 0 \\ \frac{x^2-25}{x-5} & \text{if } x \geq 0,\ x \neq 5 \\ 0 & \text{if } x = 5 \end{cases}$

Asymptotes – Identify any asymptotes.

53) $y = \frac{1}{x-1}$	54) $x^2 - y^2 = 1$	55) $y = \frac{x^2}{x^2-1}$
56) $y = \frac{3x^2}{2x^2-3x+3}$	57) $y = \frac{5x^2-5x+1}{x-1}$	58) $y = \frac{2x^2}{3x^3-4x+1}$

Even and Odd Functions *- Identify as odd, even, or neither. Show substitutions!*

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

59) $f(x) = x^3 + 3x$	60) $f(x) = x^4 - 6x^2 + 3$	61) $f(x) = \frac{x^3 - x}{x^2}$	62) $f(x) = \sin 2x$

Test for symmetry. Show substitutions.

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.

63) $y = x^4 + x^2$	64) y = sin(x)	65) y = cos(x)
66) $y = \frac{-x}{x^5 + x^3}$	67) $x = y^2 + 1$	68) $y = \frac{1}{x-2}$

LOGARITHMIC AND EXPONENTIAL FUNCTIONS

Simplify Expressions.

69) $\log_4\left(\frac{1}{16}\right)$	70) $3\log_3 3 - \frac{3}{4}\log_3 81 + \frac{1}{3}\log_3\left(\frac{1}{27}\right)$	71) $\log_9 27$	72) $\log_{125}\left(\frac{1}{5}\right)$
73) $\log_w w^{45}$	74) $\ln e$	75) ln 1	76) $\ln e^2$

Solve equations.

77) $\log_6(x+3) + \log_6(x+4) = 1$	78) $\log x^2 - \log 100 = \log 1$	79) $3^{x+1} = 15$

TRIGONOMETRY

Unit Circle – find the following without using a calculator.

80) $\sec\left(-\frac{\pi}{6}\right)$	81) $\tan\left(\frac{9\pi}{4}\right)$	82) $\cos\left(\frac{11\pi}{3}\right)$	83) $\sin\left(\frac{11\pi}{4}\right)$
84) $\cot 8\pi$	85) $\tan\left(\frac{5\pi}{2}\right)$	86) $\csc\left(\frac{-5\pi}{6}\right)$	87) $\sin\left(\frac{7\pi}{3}\right)$

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

88) $y = \sin x$	89) $y = \cos x$	90) $y = \tan x$

Identities – simplify.

91) $\frac{(\tan^2 x)(\csc^2 x)-1}{(\csc x)(\tan^2 x)(\sin x)}$	92) $1 - \cos^2 x$	93) $\sec^2 x - \tan^2 x$

Solve equations.

94) $\cos^2 x = \cos x + 2 \quad 0 \le x \le 2\pi$	95) $2\sin(2x) = \sqrt{3} \quad 0 \le x \le 2\pi$
96) $4\cos^2 x = 1 \quad \lvert x\rvert \le \pi$	97) $\cos^2 x + \sin x + 1 = 0 \quad -\frac{\pi}{2} \le x \le \frac{3\pi}{2}$

Inverse Trig Functions – Evaluate.

98) Arcsin(1)	99) Arcsin$\left(-\frac{\sqrt{2}}{2}\right)$	100) Arccos$\left(\frac{\sqrt{3}}{2}\right)$	101) in$\left(\text{Arccos}\left(\frac{\sqrt{3}}{2}\right)\right)$
102) State domain and range for: a) Arcsin(x) b) Arccos (x) c) Arctan (x)			

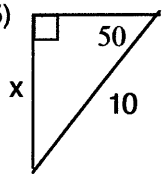
Graphing – State the amplitude and period of the following functions.

103) $y=-2\sin(2x)$	104) $y=1/4\cos(4x+12)$

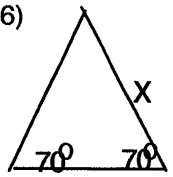
Geometry

Right Triangle Trig - Find the value of x.

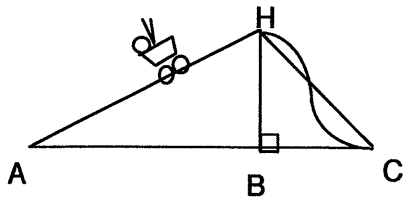
105)



106)



107)



The roller coaster car shown in the diagram above takes 23.5 sec. to go up the 23 degree incline segment AH and only 2.8 seconds to go down the drop from H to C. The car covers horizontal distances of 180 feet on the incline and 60 feet on the drop.

a) How high is the roller coaster above point B?
b) Find the distances AH and HC.
c) How fast (in ft/sec) does the car go up the incline?
d) What is the approximate average speed of the car as it goes down the drop? (Assume the car travels along HC.)
e) Is your approximate answer too big or too small?

(Advanced Mathematics, Richard G. Brown, Houghton Mifflin,1994, pg 336)