ADVANCED PLACEMENT CALCULUS SUMMER PACKET – MRS. RINEHART

This is your AP Calculus summer packet. Enclosed you will find the following items:

- Information regarding calculator requirements
- General information about the course
- The summer assignment – due on or before August 28, 2009
- AP Calculus Summer Office Hours

CALCULATOR REQUIREMENTS

You are required to have a calculator from the approved list of calculators for AP Calculus. Calculators will not be issued to students. You are expected to have your calculator in class every day. The TI-84 is the recommended calculator.

COURSE INFORMATION

AP Calculus is an extremely fast-paced and rigorous course. We will spend very little time reviewing topics covered in Math Analysis. You need to come to school next fall prepared to work hard. **You should review the topics covered on the summer assignment during the last week of August.**

AP Calculus requires an average of 1 to 1 ½ hours of homework/study time each class. Additionally, you will be expected to stay after school regularly for study sessions. Homework questions will rarely be addressed in class, but will be answered after school. Please be prepared to meet these challenges.

SUMMER ASSIGNMENT

The summer assignment is a combination of function topics covered in Math Analysis and the first topics that will be covered in AP Calculus - limits, continuity, and derivatives. The assignment is due to me on or before **August 28, 2009**. A penalty of 5 points per day will be deducted for late assignments. This assignment will be graded for correctness and counted as one test grade (approximately 1/7 of the first quarter grade).

SUMMER OFFICE HOURS

Summer office hours for AP Calculus will be offered on two different dates, Tuesday, July 21 and Tuesday, August 18. Office hours for both days will be from 12 pm to 2 pm in the THS library on both days. Students are welcome and encouraged to attend one or both of these sessions if they have any questions on the summer assignment or any questions/concerns regarding the course.

CALCULUS SUMMER ASSIGNMENT

This worksheet is due to me on or before August 28, 2009. It will be graded for correctness and it will be counted as your first test grade. All work is to be shown neatly, in pencil, on separate paper. No work, no credit!

Do not use calculators to answer these questions. All work must be shown algebraically.

1.) Find the midpoint of the segment with endpoints (5,-3) and (-7,8).

2.) Find the slope of the line that passes through (5,-3) and (-7,8).

3.) Write an equation of the line that contains (1,2) and perpendicular to x + 2y = 3.

4.) Write an equation of the line containing (-2,2) and parallel to 3x - 2y = 5.

5.) Find the domain of each of the following: Hint – many parts require a signed # line. Use your calculator to help you get the answer, but show work algebraically.

a.) $f(x) = \dfrac{x}{\sqrt{x-1}}$ b.) $f(x) = \dfrac{\sqrt{x-1}}{x}$ c.) $f(x) = x\sqrt{2+x}$

d.) $f(x) = \sqrt{(2+2x)(3-x)}$ e.) $f(x) = \sqrt{x^3 - x}$

f.) $f(x) = \sqrt{x^2 - 1}$ g.) $f(x) = \left(\sqrt{x}\right)^2$ i.) $f(x) = \sqrt{\dfrac{x}{x+1}}$

6.) Define an EVEN function. Define and ODD function.

7.) Determine whether the following functions are even, odd, or neither. **JUSTIFY** your answers using the tests for even and odd functions.

a.) $y = x^3 + x$ b.) $y = |x|$ c.) $y = (x+1)^2$ d.) $y = \sin x$

e.) $y = \cos x$ f.) $y = \tan x$ g.) $y = x^4$ h.) $y = \dfrac{x}{x^2+1}$

DO ALL GRAPHS ON GRAPH PAPER! DO NOT JUST PLOT POINTS!

8.) $f(x) = x^2 - 2x$ Sketch a graph of each of the following:

a.) f(x) b.) f(x + 1) c.) f(x) + 1 d.) -f(x)

e.) f(-x) f.) f(2x) g.) $f(|x|)$ h.) $|f(x)|$

9.) Sketch each of the following graphs:

a.) $f(x) = \frac{1}{x}$ b.) $f(x) = \frac{1}{x-1}$ c.) $f(x) = \frac{1}{x-1} + 2$

d.) $f(x) = \ln(x-1)$ e.) $f(x) = e^x$ f.) $f(x) = \sqrt{9-x}$

g.) $f(x) = x^3$ h.) $f(x) = |x+4| - 3$ i.) $f(x) = \begin{cases} x & \text{if } x > 2 \\ -4 & \text{if } x \le 2 \end{cases}$

10.) Graph each of the following conics:

a.) $(x+3)^2 + (y-6)^2 = 25$ b.) $4(y-2)^2 - 9(x+4)^2 = 36$

c.) $9(y-3)^2 + 16(x-4)^2 = 144$ d.) $(y+5) = \frac{1}{4}(x+3)^2$

11.) Solve each of the following: (Factor or use synthetic division and p/q.)

a.) $x^3 - 27 = 0$ b.) $x^3 + 4x^2 - 17x - 60 = 0$ c.) $x^2 + 3x - 9 = 0$

12.) Solve the following inequalities:

a.) $x(x+1)(x-4) < 0$ b.) $\frac{x-1}{(x+2)(x-5)} \ge 0$

13.) $f(x) = \frac{x}{x-1}$ Find the inverse of f(x).

14.) $f(x) = \frac{1}{x}$ $g(x) = \frac{x}{x+3}$ Find the composite functions $f \circ g$ and $g \circ f$. Simplify!

15.) Rewrite each absolute value function as a piecewise function without absolute value signs and graph each:

a.) $y = |2x - 3|$ b.) $y = |x - 2| + 4$

16.) Find the following limits:

a.) $\lim_{x \to 2} \frac{x^2 - 4}{x - 2}$ b.) $\lim_{x \to 2} \frac{x + 2}{x - 2}$ c.) $\lim_{x \to \infty} \frac{2x^3 - 9}{3x^3 + 4x^2 - 3}$

d.) $\lim_{x \to 3} \begin{cases} 3x + 1 & \text{if } x < 3 \\ x^2 + 4 & \text{if } x \geq 3 \end{cases}$ e.) $\lim_{x \to 1} \begin{cases} -x^2 & \text{if } x \geq 1 \\ 3x - 4 & \text{if } x < 1 \end{cases}$

17.) $f(x) = \begin{cases} 4x & \text{if } x \geq 2 \\ 2x + 4 & \text{if } x < 2 \end{cases}$

Is f(x) continuous at x = 2? Justify your answer.

18.) $f(x) = \begin{cases} x^2 - 1 & \text{if } x < 3 \\ 2kx & \text{if } x \geq 3 \end{cases}$

Find the value of k that makes f(x) a continuous function.

19.) Using the definition of derivative, find the derivative of each function:

a.) $f(x) = 3x - 4$ b.) $f(x) = x^2 + 4x - 9$

c.) $y = |x|$ Hint: Rewrite this function as a piece-wise function first.

20.) a.) Write the equation of the line tangent to $f(x) = x^2 + 5$ at x = 2.

b.) If a normal line is the line perpendicular to the tangent line, write the equation of the line normal to $f(x) = 3x^3 - 6x$ at the point $(-1,3)$ if $f'(x) = 9x^2 - 6$.

c.) Given $f'(x) = x^2 - x - 12$ and $f(-3) = 2$ and $f(4) = 7$, write an equation for each horizontal tangent to the curve f(x).