AP Calculus
3.3 Worksheet Day 1

All work must be shown in this course for full credit. Unsupported answers may receive NO credit.

1. A derivative tells you the Slope of a function.

2. What is the power rule for derivatives? (i.e. how do you take the derivative of $y = x^n$?)

$y' = n x^{n-1}$

3. For each of the following functions, find $\frac{dy}{dx}$.

a) $y = -2x^3 + x$

$\frac{dy}{dx} = -6x^2 + 1$

b) $y = \frac{x^4}{3} - \frac{x^2}{7} + 5$

$dy/$

c) $y = \frac{5}{x^2} + \frac{6}{x} - 8x^3$

d) $y = \frac{x^{-3}}{2} + 5x^{-4} - 3x^{-6}$

e) $y = 5x^4 + 2x^3 - 8x^2 - 7x + 11$

f) $y = 7x - 8$

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

h) $y = \frac{x^5 - 2x^4 + 3x^3}{x^5}$

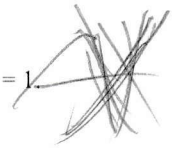
i) $y = \sqrt{x} + \frac{3}{\sqrt{x}} - 6x^{\frac{5}{3}} + \frac{7}{x^3}$

4. [Calculator Required] We want to find all points where the graph of $y = x^4 - 5x^3 - 3x^2 + 13x + 10$ has a horizontal tangent line.

a) First, find an equation for y' .

b) A horizontal tangent line will have a slope = _____ . So set $y' =$ _____, and use your calculator to solve this equation.

5. Find the equation of the tangent line to the function $y = \dfrac{x^2 + x - 2}{2x}$ at the point where $x = 1$.



6. Find the equation of the normal line to the function $y = x^3 - 5x + 1$ at the point when $x = 2$.

7. Find the points on the curve $y = x^3 + 3x^2 - 9x + 7$ where the tangent line is parallel to the x-axis.

8. Consider the curve $y = x^3 + x$.

   a) Find the tangents to the curve at all the points where the slope is 4. (be careful! … it doesn't say $x = 4$!)

   b) What is the smallest slope of the curve? At what value of x does the curve have this value?

9. Find the x- and y-intercepts of the line that is tangent to the curve $y = x^3$ at the point (–2, –8).

10. If the line normal to the graph of f at the point (1, 2) passes through the point (–1, 1), then which of the following gives the value of $f'(1)$?

A	–2
B	2
C	–1/2
D	1/2
E	3

To be differentiable at a point, the left and right derivatives must be equal at that point (see last WS). Use this concept and the definition of continuity to solve for the parameters (those are those pesky little letters) in the next question.

11. Solve for a and b in order for $g(x)$ to be both continuous and differentiable at $x = 0$. (look back at the 3.2 WS if you need help)

$$g(x) = \begin{cases} ax + b & ; x > 0 \\ 1 - x + x^2 & ; x \le 0 \end{cases}$$

12. When $x = 8$, the rate at which $\sqrt[3]{x}$ is increasing is $\frac{1}{k}$ times the rate at which x is increasing. What is the value of k?

A) 3
B) 4
C) 6
D) 8
E) 12

13. Let $f(x) = \sqrt{x}$. If the rate of change of f at $x = c$ is twice its rate of change at $x = 1$, then $c =$

A) $\frac{1}{4}$
B) 1
C) 4
D) $\frac{1}{\sqrt{2}}$
E) $\frac{1}{2\sqrt{2}}$

14. [Calculator] Which of the following is an equation of the tangent line to $f(x) = x^4 + 2x^2$ at the point where $f'(x) = 1$?

A) $y = 8x - 5$
B) $y = x + 7$
C) $y = x + .763$
D) $y = x - .122$
E) $y = x - 2.146$