Name:_____

AP Calculus

Section 2.3 Review

1. If the line tangent to the graph of the function f at the point $(1,7)$ passes through the point $(-2,-2)$, then $f'(1)$ is
   (A) -5
   (B) 1
   (C) 3
   (D) 7
   (E) Undefined

2. An equation of the line tangent to $y = 4x^3 - 7x^2$ at $x = 3$ is
   (A) $y + 45 = 66(x + 3)$
   (B) $y - 45 = 66(x - 3)$
   (C) $y = 66x$
   (D) $y = 66(x - 3)$
   (E) $y - 45 = -\frac{1}{66}(x - 3)$

3. At what point on the graph of $y = \frac{1}{2}x^2$ is the tangent line parallel to the line $2x - 4y = 3$?
   (A) $\left(\frac{1}{2}, -\frac{1}{2}\right)$
   (B) $\left(\frac{1}{2}, \frac{1}{8}\right)$
   (C) $\left(1, -\frac{1}{4}\right)$
   (D) $\left(1, \frac{1}{2}\right)$
   (E) (2,2)

4. Let f be a differentiable function such that $f(3) = 2$ and $f'(3) = 5$. If the tangent line to the graph of f at $x = 3$ is used to find an approximation to a zero of f, that approximation is
   (A) 0.4
   (B) 0.5
   (C) 2.6
   (D) 3.4
   (E) 5.5

5. An equation of the line tangent to the graph of $y = x + \cos x$ at the point $(0,1)$ is
   (A) $y = 2x + 1$
   (B) $y = x + 1$
   (C) $y = x$
   (D) $y = x - 1$
   (E) $y = 0$

6. In the xy-plane, the line $x + y = k$, where k is a constant, is tangent to the graph of $y = x^2 + 3x + 1$. What is the value of k?
   (A) -3
   (B) -2
   (C) -1
   (D) 0
   (E) 1

7. What is the slope of the line tangent to the curve $y = arc\tan(4x)$ at the point at which $x = \frac{1}{4}$?

(A) 2
(B) $\frac{1}{2}$
(C) 0
(D) $-\frac{1}{2}$
(E) -2

8. Let f be the function given by $f(x) = 3e^{2x}$ and let g be the function given by $g(x) = 6x^3$. At what value of x do the graphs of f and g have parallel tangent lines?

(A) -0.701
(B) -0.567
(C) -0.391
(D) -0.302
(E) -0.258

9. The line normal to the curve $y = \sqrt{16 - x}$ at the point (0,4) has slope

(A) 8
(B) 4
(C) $\frac{1}{8}$
(D) $-\frac{1}{8}$
(E) -8

10. The function f is continuous for $-2 \leq x \leq 1$ and differentiable for $-2 < x < 1$. If $f(-2) = -5$ and $f(1) = 4$, which of the following statements could be false?

(A) There exists c, where $-2 < c < 1$, such that $f(c) = 0$.
(B) There exists c, where $-2 < c < 1$, such that $f'(c) = 0$.
(C) There exists c, where $-2 < c < 1$, such that $f(c) = 3$.
(D) There exists c, where $-2 < c < 1$, such that $f'(c) = 3$.
(E) There exists c, where $-2 \leq c \leq 1$, such that $f(c) \geq f(x)$ for all x on the closed interval $-2 \leq x \leq 1$.

11. Let f be a differentiable function $f(2) = 3$ and $f'(2) = -5$, and let g be the function defined by $g(x) = xf(x)$. Which of the following is an equation of the line tangent to the graph of g at the point where $x = 2$?

(A) $y = 3x$
(B) $y - 3 = -5(x - 2)$
(C) $y - 6 = -5(x - 2)$
(D) $y - 6 = -7(x - 2)$
(E) $y - 6 = -10(x - 2)$

Differentiate each function with respect to x.

12) $f(x) = (4x^4 + 1) \cdot -x^2$

13) $y = \dfrac{4x^5 - 2x^3}{5x^3 - 5}$

14) $f(x) = (3x^5 - 1)(x^5 + 4x^4 - 5)$

For each problem, find the points where the tangent line to the function is horizontal. Indicate if no horizontal tangent line exists.

15) $f(x) = -\sin(x)$; $[-\pi, \pi]$

For each problem, find the equation of the line tangent to the function at the given point. Your answer should be in slope-intercept form.

16) $f(x) = \cos(x)$ at $\left(\dfrac{5\pi}{6}, -\dfrac{\sqrt{3}}{2}\right)$

For each problem, find the equation of the line normal to the function at the given point. If the normal line is a vertical line, indicate so. Otherwise, your answer should be in slope-intecept form.

17) $f(x) = -x^3 + x^2 - 1$ at $(1, -1)$

For each problem, you are given a table containing some values of differentiable functions $f(x)$, $g(x)$ and their derivatives. Use the table data and the rules of differentiation to solve each problem.

18)

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	1	1	2	1
2	2	1	3	1
3	3	1	4	0
4	4	1	3	−1

Part 1) Given $h_1(x) = f(x) + g(x)$, find $h_1'(2)$

Part 2) Given $h_2(x) = f(x) - g(x)$, find $h_2'(2)$

Part 3) Given $h_3(x) = f(x) \cdot g(x)$, find $h_3'(1)$

Part 4) Given $h_4(x) = \dfrac{f(x)}{g(x)}$, find $h_4'(4)$