AP Calculus
3.3 Worksheet

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

1. Solve for a and b in order for $f(x)$ to be both continuous and differentiable at $x = 1$.

$$f(x) = \begin{cases} x^2 + 2 & ; x \le 1 \\ a\left(x - \frac{1}{x}\right) + b & ; x > 1 \end{cases}$$

2. Solve for a and b in order for $g(x)$ to be both continuous and differentiable at $x = 0$.

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

3. For $a - d$, find $f'(2)$ given the following information:

$$g(2) = 3 \quad g'(2) = -2$$
$$h(2) = -1 \quad h'(2) = 4$$

a) $f(x) = 2g(x) + h(x)$

b) $f(x) = 4 - h(x)$

c) $f(x) = g(x)h(x)$

d) $f(x) = \dfrac{g(x)}{h(x)}$

4. Find all points where the graph of $y = x^4 - 5x^3 - 3x^2 + 13x + 10$ has a horizontal tangent line.

5. Find the equation of the tangent line to the graph of $f(x) = (x^3 - 3x + 1)(x + 2)$ at the point (1, –3).

6. Let $f(x) = (3x^3 + 4x^2)(2x^4 - 5x)$. Find $f'(x)$ without using the product rule first, then using the product rule.

7. An equation of the line tangent to the graph of $y = \dfrac{2x + 3}{3x - 2}$ at the point (1, 5) is

A) $13x - y = 8$ B) $13x + y = 18$ C) $x - 13y = 64$ D) $x + 13y = 66$ E) $-2x + 3y = 13$

8. 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

9. 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) $\frac{1}{2\sqrt{2}}$

10. What is the instantaneous rate of change at $x = 2$ of the function f given by $f(x) = \dfrac{x^2 - 2}{x - 1}$?

A) –2

B) $\frac{1}{6}$

C) $\frac{1}{2}$

D) 2

E) 6

11. 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) $y = x - 2.146$

12. 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) $\left(2, 2\right)$

13. If u, v, and w are nonzero differentiable functions, then the derivative of $\dfrac{uv}{w}$ is

A) $\dfrac{uv' + u'v}{w'}$

B) $\dfrac{u'v'w - uvw'}{w^2}$

C) $\dfrac{uvw' - uv'w - u'vw}{w^2}$

D) $\dfrac{u'vw + uv'w + uvw'}{w^2}$

E) $\dfrac{uv'w + u'vw - uvw'}{w^2}$

14. 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

15. Complete the following questions from the textbook:
    pages 124 – 126 #1 – 9 (odd), 14, 17, 18, 20, 21, 23, 26, 27, 30, 37 – 40, 42, 47, 56