

# Pre-Calculus – Unit 15

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

## 15 REVIEW – Intro to Calculus

### Pre-Calculus

Evaluate each limit.

1.  

$$\lim_{x \rightarrow -1} (4x^2 - 2x + 1)$$

2.  

$$\lim_{x \rightarrow 3} \sqrt{2x - 2}$$

3.  

$$\lim_{x \rightarrow 2} 7$$

4.  

$$\lim_{x \rightarrow 1} \frac{\sqrt{x+2} + \sqrt{3}}{2x}$$

5.  

$$\lim_{x \rightarrow \frac{\pi}{2}} \sin(3x)$$

6.  

$$\lim_{x \rightarrow 2} \frac{x^2 - 4x}{x - 2}$$

7.  

$$\lim_{x \rightarrow 5} \frac{x^2 + x - 30}{x - 5}$$

8.  

$$\lim_{x \rightarrow 0} \frac{3x^3 - 5x^2 + 13x}{x^2 - 7x}$$

9.  

$$\lim_{x \rightarrow 3} \frac{x^2 - 2x - 3}{3 - x}$$

10.  

$$\lim_{x \rightarrow 0} \frac{\sqrt{x+10} - \sqrt{10}}{x}$$

11.  

$$\lim_{x \rightarrow 0} \frac{\sqrt{x+16} - 4}{x}$$

12.  

$$\lim_{x \rightarrow 0} \frac{1}{x+5} - \frac{1}{5}$$

Find the derivative *using limits*. (SHOW WORK!)

13.  $y = 4 - 3x$

14.  $y = 4x^2 - 6x + 3$

15.  $f(x) = \sqrt{6x - 5}$

For each problem, create an equation of the tangent line of  $f$  at the given point. Answer can be in point-slope form OR slope-intercept.

16.  $f(-5) = 9$  and  $f'(-5) = -4$

17.  $f(2) = -5$  and  $f'(2) = 3$

18. If  $f(x) = \sin 4x$  and its derivative is  $f'(x) = 4 \cos 4x$ , find an equation of the tangent line at  $x = \frac{\pi}{4}$ .

Find the derivative of each expression and simplify.

19.  $f(x) = 6e^5$

20.  $h(x) = \frac{x}{5}$

21.  $w(t) = 4$

22.  $y = 5x^2 + 10x - 8$

23.  $y = \frac{9}{x}$

24.  $f(x) = \frac{5}{x^2}$

25.  $6\sqrt{x}$

26.  $\sqrt[7]{x^8}$

27.  $\sqrt{x}(\sqrt[5]{x} - \sqrt[3]{x})$

28. If  $f(x) = \frac{1}{\sqrt[3]{x}}$  find the value of the derivative at  $x = 8$ .

29. Determine the  $x$ -value(s) at which  $y = \frac{1}{3}x^3 - \frac{3}{2}x^2$  has a horizontal tangent line.

Find the equation of a tangent line of each function at the indicated point.

30.  $f(x) = 3\sqrt{x} - x^2$ ;  $x = 4$

31.  $f(x) = 3x^2 + 2x$ ;  $x = -2$

## Application/Extension from Unit 15

This is just practice and a reminder. These problems **may or may not** match what is on the test.

1. Using the following piecewise functions, find the given values.

$$g(x) = \begin{cases} \sqrt{7-x}, & x < -9 \\ 5-x^2, & -9 \leq x < 1 \\ x+3, & x \geq 1 \end{cases}$$

$$\lim_{x \rightarrow 1^-} g(x) =$$

$$\lim_{x \rightarrow -9^+} g(x) =$$

$$g(1) =$$

$$\lim_{x \rightarrow -9^-} g(x) =$$

$$\lim_{x \rightarrow 1^+} g(x) =$$

$$\lim_{x \rightarrow 1} g(x) =$$

$$\lim_{x \rightarrow -9} g(x) =$$

$$g(-9) =$$

2.  $m$  is the amount of money in Brust's checking account and  $t$  is the number of weeks after Jan 1. Identify the meaning of the two equations. Write in full sentences!  $m(51) = 5000$  and  $m'(51) = -895$

3. Mr. Sullivan throws all of Mr. Bean's favorite Jelly Beans out the window on the 2<sup>nd</sup> floor of the school building. The height of the Jelly Beans can be modeled by  $h(t) = -16t^2 + 23t + 17$  where  $s$  is measured in feet and  $t$  is measured in seconds.

a) How high are the Jelly Beans after 0.5 seconds?

b) Find a velocity function  $v(t)$  for the Jelly Beans' vertical velocity.

c) What are the Jelly Beans' vertical velocity after 0.5 seconds?

d) How long until the Jelly Beans hit the ground?

e) Find an acceleration function  $a(t)$  for the Jelly Beans.

f) When velocity and acceleration have the same sign (positive or negative), an object is speeding up. If they have different signs, the object is slowing down. In this situation, at 1 second what is the sign of velocity? What is the sign of acceleration? Are the Jelly Beans speeding up or slowing down?