



# Calculus

Week # 1

**AP CALCULUS AB  
CHAPTER 1 TEST**

***DIRECTIONS:***

To receive full credit you must show all work. Leave your answers in radical form or as a reduced fraction unless specified otherwise.

**GOOD LUCK**

The following problems are worth 4 points each.

1. Give an example of a continuous function
  2. Give an example of a function that has a non-removable discontinuity at  $x = -8$ .
  3. Give an example of a function that has a removable discontinuity at  $(3, -4)$ .
- A. For questions 4-6 find any vertical Asymptotes or holes in the graphs. If there is a hole in the graph write it as an ordered pair.

4.  $f(x) = \frac{4}{x+5}$

5.  $f(x) = \frac{x^2 - x - 6}{x - 3}$

6.  $f(x) = \frac{x^2 - 4}{x^2 + 7x - 18}$

The following problems are worth 6 points each.

B. For questions 7-20 find each limit. If the limit does not exist then write “No Limit”. Give a reason for your answer.

7.  $\lim_{x \rightarrow 4} 3x^3 - 8x + 6$

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

9.  $\lim_{x \rightarrow \frac{\pi}{2}} \frac{\sin x}{x}$

10.  $\lim_{x \rightarrow -3^-} \frac{x-2}{x^2 - x - 12}$

11.  $\lim_{x \rightarrow 4^+} \frac{-1}{x-4}$

12.  $\lim_{x \rightarrow 3} \|x\| + 1$

13.  $\lim_{\Delta x \rightarrow 0} \frac{3(x + \Delta x)^2 - 3x^2}{\Delta x}$

$$14. \quad \lim_{x \rightarrow 6^+} \frac{x-7}{x-6}$$

$$15. \quad \lim_{x \rightarrow 9} \frac{x^2 + x - 90}{81 - x^2}$$

$$16. \quad \lim_{x \rightarrow -3^-} \|x\| - 4$$

$$17. \quad \lim_{x \rightarrow 7} f(x) = \begin{cases} 2x - 5 & \text{if } x \neq 7 \\ 12 & \text{if } x = 7 \end{cases}$$

$$18. \quad \lim_{x \rightarrow 3^-} f(x) = \begin{cases} 3x + 4 & \text{if } x < 3 \\ -7 & \text{if } x \geq 3 \end{cases}$$

$$19. \quad \lim_{x \rightarrow \frac{\pi}{6}} 2x \csc x$$

$$20. \quad \lim_{x \rightarrow 0} \frac{\sin 4x}{5x}$$

The following problems are worth 12 points each.

21. If the limit of  $f(x) = 2$  and the limit of  $g(x) = -\frac{1}{4}$  as  $x \rightarrow c$  for both  $f(x)$  and  $g(x)$ . Find the limit of

a.  $f(x) + 8g(x)$

b.  $2f(x) \div 12g(x)$

c.  $-3f(x)$

22. Find the value of  $c$  so that the following function is continuous everywhere on the real number line.

$$f(x) = \begin{cases} x^2 + 7 & \text{if } x \leq -3 \\ \frac{2c - 8}{x} & \text{if } x > -3 \end{cases}$$

23. Use the intermediate value theorem to find the value of  $c$  for the indicated function and interval.  $\frac{x^2 + x}{x + 3}$   $[-4, 1]$  Where  $f(c) = 2$ .

The following problem is worth 16 points.

24. Use the bisection method three times to show that  $f(x) = 2x^3 - 4x + 3$  has a zero on the interval  $[-3, 1]$ . Round your final answers to the nearest thousandth place. Write the exact zero of the function.

**AP CALCULUS AB**  
**CHAPTER 2 TEST**

**DIRECTIONS:**

To receive full credit you must show all work on a separate sheet of paper. Leave your final answers in terms of  $\pi$  or as a radical, and use positive exponents.

**GOOD LUCK**

The following problems are worth 8 points each.

1. Use the definition of the derivative to find the derivative of  $f(x) = 2x^2 - 5$ .

2. Find  $dy/dx$  for the function  $f(x) = 4x^5$

3. Find  $dy/dx$  for the function  $f(x) = 2x^\pi$

4. Find  $dy/dx$  for the function  $f(x) = \frac{3}{x^7}$

5. Find  $dy/dx$  for the function  $f(x) = (7x + 2)^5$

6. Find  $dy/dx$  for the function  $f(x) = \cos x + 3\sin x$

7. Find  $dy/dx$  for the function  $\frac{5x}{1 - \sec x}$

8. Find  $dy/dx$  for the function  $f(x) = 6x^3(4 - x)^2$

9. Find  $dy/dx$  for the function  $f(x) = 5\tan^4(7x)$

10. Find  $dy/dx$  for the function  $f(x) = 25\sqrt[5]{x^7}$

11. Find  $d^2y/dx^2$  for the function  $x^2y^2 = 4$

12. Find  $dy/dx$  for the function  $3x + x^2y = 2y^3 - 7$

13. Find  $d^2y/dx^2$  for the  $x^2 + y^2 = 100$  at the point  $(-8, 6)$

14. Find  $y''''$  of  $y = -3\cos 5x$ .

15. Find  $y''''$  of  $y = \frac{1}{2}x^{-4}$

A. Use the information below to answer questions 16-18.

x	u	u'	v	v'
1	1	-1	4	7
2	3	12	-5	2
3	-4	6	10	-3

16. If  $A = u - 4v$  find  $A'$  when  $x = 2$ .
17. If  $B = 4u/v$  find  $B'$  when  $x = 1$
18. If  $D = -2uv$  find  $D'$  when  $x = 3$
19. Find the equation of the tangent line at the indicated point.  $f(x) = \sin 2x$  at  $\left(\frac{\pi}{4}, 1\right)$
20. Find the coordinates where the function  $y = 3x^2 - 12x$  has a horizontal tangent.

The following problem is worth 10 points.

21. Suppose an M&M is dropped off a building with an initial height of 192 feet and an initial velocity of 176 feet per second.
- Find the position equation for the M&M at any time  $t \geq 0$ .
  - When will the M&M hit the ground?
  - What is the instantaneous velocity of the M&M after 3 sec.?
  - What is the velocity of the M&M at any time  $t \geq 0$ ?
  - What is the velocity of the M&M when it makes impact with the ground?
22. Veronica is standing 90 meters due west of a set of north south railroad tracks. A southern bound train passes traveling at 40 meters per second. How fast is the distance between Veronica and the train changing after 3 sec.?
23. Coffee is being pored into a cylinder at the rate of  $18 \text{ cm}^3/\text{min}$ . The diameter of the cylinder is 2 times the height. How fast is the level of coffee changing when the height is 6 cm?  
 $V = \pi r^2 h$
24. A 13 foot long ladder is leaning against the side of a house. The top of the ladder is sliding down the side of the house at a rate of 4 ft/sec.
- How fast is the bottom of the ladder moving ways from the house when the ladder touches the house 12 feet above the ground?
  - How fast is the angle between the bottom of the ladder and the ground changing when the angle is  $30^\circ$ ?
  - Use the information from part a to help the question at what rate is the area of the triangle changing?

