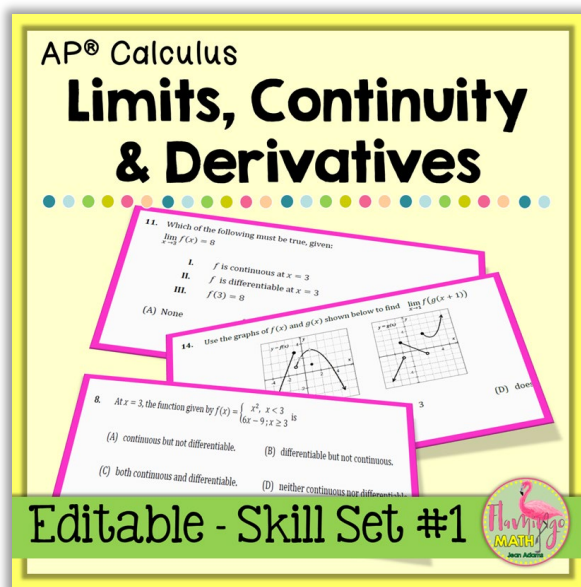


# Limits Continuity & Derivatives Skill Set #1



## KEY CONCEPTS/TOPICS:

- Topic 1.5 Determining Limits Using Algebraic Properties
- Topic 1.3 Estimating Limits from Graphs
- Topic 1.11 Defining Continuity at a Point
- Topic 1.13 Removing Discontinuities
- Topic 1.14 Connecting Infinite Limits and Vertical Asymptotes
- Topic 2.3 Estimating Derivatives of a Function at a Point
- Topic 2.4 Connecting Differentiability and Continuity
- Topic 2.5 Applying the Power Rule
- Topic 2.7 Derivatives of  $\cos x$ ,  $\sin x$ ,  $e^x$ , and  $\ln x$
- Topic 2.8 The Product Rule
- Topic 2.9 The Quotient Rule
- Topic 3.1 The Chain Rule
- Topic 3.6 Higher Order Derivatives

## Product Overview

Your Calculus students will practice AP-Style multiple choice questions related to the first three units in the course with this 20-question skill set. The fully-editable resource is designed as a series of “Multiple Choice Monday” Exam Prep and Practice. All questions in the set are non-calculator prompts and should be able to be completed in a 40-50 minute class period.

# Multiple Choice Monday

## Multiple Choice Monday Limits, Continuity and Derivatives

Name \_\_\_\_\_

1.  $\lim_{\theta \rightarrow 0} \frac{1 - \cos \theta}{2 \sin^2 \theta} =$

- (A) 0 (B)  $\frac{1}{8}$  (C)  $\frac{1}{4}$  (D) 1

2.  $\lim_{x \rightarrow \frac{1}{2}} \frac{9x^2 - 1}{3x - 1} =$

- (A)  $\infty$  (B)  $-\infty$

3.  $\frac{dy}{dx}$

(B)  $-2 \cos$

(D)  $6 \cos 3x$

4. If  $f(x) = \frac{\sqrt{x+5} - \sqrt{x+7}}{x-2}$ , for  $x \neq 2$ , is continuous at  $x=2$ , then  $k =$

- (A)  $\frac{7}{5}$  (B)  $\frac{1}{6}$  (C)  $\frac{1}{3}$  (D) 1

5.  $\lim_{x \rightarrow \infty} \frac{4x^2 - 3x + 2}{5x - 3x^2 + 1} =$

- (A)  $-\frac{4}{5}$  (B)  $-\frac{4}{5}$  (C)  $\infty$

6.  $\frac{d^4}{dx^4} (x^5)$ , then the 4th derivative is

- (A) 24 (B)  $4^5$  (C)  $\sec^2(3x)$  (D) nonexistent

8. At  $x=3$ , the function given by  $f(x) = \begin{cases} x^2, & x < 3 \\ 6x - 9, & x \geq 3 \end{cases}$  is

- (A) continuous but not differentiable. (B) differentiable but not continuous.  
(C) both continuous and differentiable. (D) neither continuous nor differentiable.

9. If  $f(x) = (x-1)^2 \sin x$ , then  $f'(0) =$

- (A) -2 (B) -1 (C) 0 (D) 1



Students gain valuable practice for AP Calculus Exam concepts

10. An equation of the line tangent to the graph of  $f(x) = x(1 - 2x)^2$  at the point  $(1, -1)$  is

- (A)  $y = -6x + 5$       (B)  $y = -7x + 6$       (C)  $y = 2x - 3$       (D)  $y = 7x - 8$

11. Which of the following must be true, given:

$$\lim_{x \rightarrow 3} f(x) = 8$$

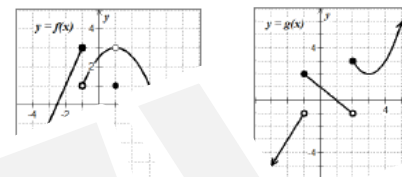
- I.  $f$  is continuous at  $x = 3$   
 II.  $f$  is differentiable at  $x = 3$   
 III.  $f(3) = 8$

- (A) None      (B) II only      (C) I and III

13. Let  $f$  be a function defined by  $f(x) = \frac{x^2}{4+x^2}$ . If  $f$  is a function, what is  $f'(x)$ ?

(A) 5      (B) 1      (C) -6      (D) -5

14. Use the graphs of  $f(x)$  and  $g(x)$  shown below to find  $\lim_{x \rightarrow 1} f(g(x))$ .



- (A) 1      (B) 2      (C) 3      (D) 4      (E) does not exist

$f$  is continuous at  $x = 1$  and  $f$  is differentiable at  $x = 1$ .

$$f'(c) = \lim_{x \rightarrow c} \frac{f(x) - f(c)}{x - c} \text{ for some } c \text{ such that } a < c < b$$

$$f'(c) = 0 \text{ for all } c \text{ such that } a < c < b$$

$$f(x) = 0 \text{ for all } x \text{ such that } a < x < b$$

16. Determine the value of  $k$  so that  $f(x)$  is continuous for all real numbers given:

$$f(x) = \begin{cases} x^2, & x < 3 \\ k, & x = 3 \\ \frac{k}{x}, & x > 3 \end{cases}$$

- (A) 9      (B) -54      (C) 27      (D) no value for  $k$



17. If  $f(x) = 5x^2 - 3x$ , then find  $\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$

- (A)  $5x - 3$  (B)  $10x - 3$  (C)  $10x$  (D)  $7x - 3$

18. If  $\lim_{x \rightarrow c} f(x) = -3$  and  $\lim_{x \rightarrow c} g(x) = 2$ , what is the value of  $\lim_{x \rightarrow c} [4f(x) + g^2(x)]$ ?

- (A) 17 (B) 8 (C) -8 (D) -10

19. Find  $\lim_{x \rightarrow 4^+} \frac{3x^2 + 12x + 4}{x^2 - 16}$

- (A)  $\infty$  (B)  $-\infty$  (C)  $\frac{1}{3}$  (D)  $-\frac{1}{3}$

Consider the function  $g(x)$  defined on the interval  $(-\infty, \infty)$  by the formula

$$g(x) = \frac{x^2 - 3}{2x - 1}$$

Which of the following statements are true?  
 I.  $g$  is continuous at  $x = 3$   
 II.  $g$  is differentiable at  $x = 3$   
 III.  $g$  has a vertical asymptote at  $x = 3$

- (A) I (B) II only (C) III only (D) II and III only

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

AP CALCULUS

Multiple Choice

Monday

I. Multiple Choice (No Calculator)

|     |     |     |     |     |
|-----|-----|-----|-----|-----|
| 1.  | (A) | (B) | (C) | (D) |
| 2.  | (A) | (B) | (C) | (D) |
| 3.  | (A) | (B) | (C) | (D) |
| 4.  | (A) | (B) | (C) | (D) |
| 5.  | (A) | (B) | (C) | (D) |
| 6.  | (A) | (B) | (C) | (D) |
| 7.  | (A) | (B) | (C) | (D) |
| 8.  | (A) | (B) | (C) | (D) |
| 9.  | (A) | (B) | (C) | (D) |
| 10. | (A) | (B) | (C) | (D) |
| 11. | (A) | (B) | (C) | (D) |
| 12. | (A) | (B) | (C) | (D) |
| 13. | (A) | (B) | (C) | (D) |
| 14. | (A) | (B) | (C) | (D) |
| 15. | (A) | (B) | (C) | (D) |
| 16. | (A) | (B) | (C) | (D) |
| 17. | (A) | (B) | (C) | (D) |
| 18. | (A) | (B) | (C) | (D) |
| 19. | (A) | (B) | (C) | (D) |
| 20. | (A) | (B) | (C) | (D) |



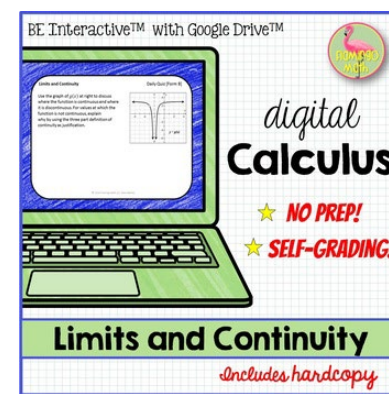
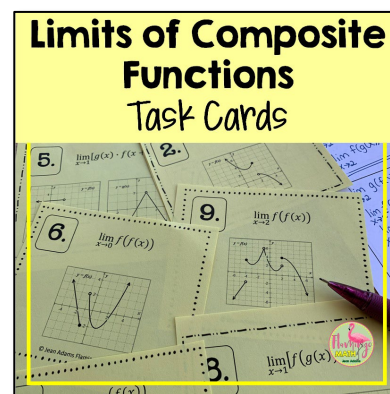
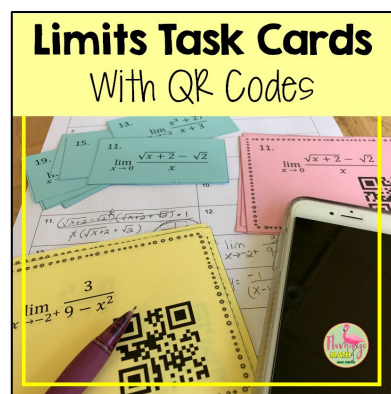
Use as a timed-practice test prep prior to the AP Exam



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