

**AP Calculus AB Unit 2 — Differentiation – Definition and Basic Derivative Rules
Practice Test**

Question 1

Find $f'(2)$ if the function $f(x)$ is given by $f(x)=\ln(x)$.

- A. -1
- B. $\frac{3}{2}$
- C. 0
- D. 1
- E. $\frac{1}{2}$

Question 2

Find the derivative of the following function at the point $x=3$.

$$f(x)=4x^3+x+3$$

- A. 109
- B. 108
- C. 107
- D. 106
- E. 110

Question 3

If $p(t)$ gives the position of an asteroid as a function of time, find the function which models the velocity of the asteroid as a function of time.

$$p(t)=-365\sin(t)+12t^3-3t^2+164$$

- A. $p'(t)=-365+\cos(t)+36t^3-6t$
- B. $p'(t)=365\cos(t)+36t^3-6t$
- C. $p'(t)=-365\cos(t)+36t^3-6t+164$
- D. $p'(t)=-365\cos(t)+36t^2-6t$

Question 4

The function $f(x)$ is differentiable at the point $(a, f(a))$. List which of the following statements must be true about $f(x)$:

1. The limit $\lim_{x \rightarrow a} \frac{f(x) - f(a)}{x - a}$ exists.

2. $\lim_{x \rightarrow a^-} f(x) = \lim_{x \rightarrow a^+} f(x)$

3. $\lim_{x \rightarrow a} \frac{f(x) - f(a)}{x - a} = f'(a)$

4. $\lim_{x \rightarrow a} f(x) = f(a)$

5. $\lim_{x \rightarrow a} f(x) = \lim_{x \rightarrow a} \frac{f(x) - f(a)}{x - a}$

- A. 1, 3, and 5
- B. All must be true
- C. 1 and 5
- D. 1, 2, and 4
- E. 1, 3, 4, and 5

Question 5

Find the derivative of the function,

$$y = x^2 \sin(3x)$$

- A. $\frac{dy}{dx} = 3x^2 \cos(3x) + 2x \sin(3x)$
- B. $\frac{dy}{dx} = x^2 \cos(3x) + 2x \cos(3x)$
- C. $\frac{dy}{dx} = 6x \cos(3x)$
- D. $\frac{dy}{dx} = x[3x \cos(3x) + 2]$
- E. $\frac{dy}{dx} = -3x^2 \cos(x) + 2x \sin(x)$

Question 6

What is the derivative of $y = 3 \sec \theta$, with respect to θ ?

- A. $\frac{dy}{d\theta} = -3 \sec \theta \tan \theta$
- B. $\frac{dy}{d\theta} = \frac{1}{6 \tan \theta}$

C. $\frac{dy}{d\theta} = \frac{-1}{3\sec^2\theta}$

D. $\frac{dy}{d\theta} = 3\sec\theta \tan\theta$

Question 7

Which of the following is false given the following function?

$$y = f(x) = \tan x$$

A. $f'(x) = \sec^2 x$

B. $y' = \sec^2 x$

C. $\frac{dx}{dy} = \sec^2 x$

D. $\frac{d}{dx}(f(x)) = \frac{1}{\cos^2 x}$

Question 8

Let $g(x) = x^{-10}$. Find $g'(1)$.

A. 10

B. 1

C. -10

D. -1

Question 9

Let $g(x) = x^{\frac{4}{3}}$. Find $g'(27)$.

A. 4

B. $\frac{1}{3}$

C. 9

D. $\frac{1}{27}$

Question 10

Let $g(x) = \sqrt[4]{x^3}$. Find $g'(1)$.

- A. $\frac{4}{3}$
- B. $\frac{3}{4}$
- C. 1
- D. -1

Question 11

Devin tried to find the derivative of $-3x - 11$ using basic differentiation rules. Here is his work:

$$\frac{d}{dx}(-3x - 11)$$

$$\text{Step 1} = \frac{d}{dx}(-3x) - \frac{d}{dx}(11)$$

$$\text{Step 2} = \frac{d}{dx}(-3x) - 0$$

$$\text{Step 3} = -3 \frac{d}{dx}(x)$$

$$\text{Step 4} = -3 \cdot 1$$

$$\text{Step 5} = -3$$

At which step did Devin make a mistake, if at all?

- A. Step 1
- B. Step 2
- C. Step 3
- D. Devin did not make a mistake

Question 12

The following table lists the value of functions g and h , and of their derivatives, g' and h' , for $x=2$.

x	$g(x)$	$h(x)$	$g'(x)$	$h'(x)$
2	17	-18	-1	-3

Evaluate $\frac{d}{dx}[3g(x)-8h(x)+4]$ **at** $x=2$.

- A. -3
- B. 2
- C. 21
- D. -12

Question 13

Let $g(x)=\frac{3}{x^2}+\frac{1}{x}$. **Find** $g'(3)$.

- A. $\frac{1}{3}$
- B. $-\frac{1}{3}$
- C. $\frac{1}{2}$
- D. $-\frac{1}{2}$

Question 14

Which of the following is an equation of the line tangent to the graph of
 $h(x)=x^4-2x^2+2x$ **at the point where** $x=1$.

- A. $y=x+1$
- B. $y=2x+1$
- C. $y=2x-1$
- D. $y=x-1$

Question 15

Let $g(x)=3x^4-7\ln(x)$ **Find** $g'(x)$.

- A. $3x^4-\frac{7}{x}$
- B. $3x^4-7x$
- C. $12x^3-\frac{7}{x}$
- D. $12x^4-7x$

Question 16

Let $h(x) = \frac{x^2+5}{x^2-1}$ Find $h'(0)$.

- A. -5
- B. -12
- C. 0
- D. 1

Answer Key

- 1. E
- 2. A
- 3. D
- 4. D
- 5. A
- 6. A
- 7. C
- 8. C
- 9. A
- 10. B
- 11. D
- 12. C
- 13. B
- 14. C
- 15. C
- 16. C