

Chapter 2 MC Questions Part I

1.

A particle moves on the x -axis in such a way that its position at time t is given by $x(t) = 3t^5 - 25t^3 + 60t$. For what values of t is the particle moving to the left?

- A) $-2 < t < 1$ only
- B) $-2 < t < -1$ and $1 < t < 2$
- C) $-1 < t < 1$ and $t > 2$
- D) $1 < t < 2$ only
- E) $t < -2$, $-1 < t < 1$, and $t > 2$

2.

If the line $y = 4x + 3$ is tangent to the curve $y = x^2 + c$, then c is

- A) 2
- B) 4
- C) 7
- D) 11
- E) 15

3.

The volume of an expanding sphere is increasing at a rate of 12 cubic feet per second. When the volume of the sphere is 36π cubic feet, how fast, in square feet per second, is the surface area increasing?

- A) 8
- B) 6
- C) 8π
- D) $\frac{8\pi}{3}$
- E) 10

4.

Consider the function $f(x) = \begin{cases} \frac{\sin x}{x} & x \neq 0 \\ k & x = 0 \end{cases}$

In order for $f(x)$ to be continuous at $x = 0$, the value of k must be

- A) 0
- B) 1
- C) -1
- D) π
- E) a number greater than 1

5.

If $y^2 - 2xy = 21$ then $\frac{dy}{dx}$ at the point $(2, -3)$ is

- A) $-6/5$
- B) $-3/5$
- C) $-2/5$
- D) $3/8$
- E) $3/5$

6.

If $\sin(xy) = x^2$, then $\frac{dy}{dx} =$

- A) $2x\sec(xy)$
- B) $\frac{\sec(xy)}{x^2}$
- C) $2x\sec(xy) - y$
- D) $\frac{2x\sec(xy)}{y}$
- E) $\frac{2x\sec(xy) - y}{x}$

7.

The equation of the normal line to the curve $y = \sqrt[3]{x^2 - 1}$ at the point where $x = 3$ is

- A) $y + 12x = 38$
- B) $y - 4x = 10$
- C) $y + 2x = 4$
- D) $y + 2x = 8$
- E) $y - 2x = -4$

8.

The equation of the tangent line to the curve $y = \frac{3x+4}{4x-3}$ at the point $(1, 7)$ is

- A) $y + 25x = 32$
- B) $y - 31x = -24$
- C) $y - 7x = 0$
- D) $y + 5x = 12$
- E) $y - 25x = -18$

9.

A particle moves along the x-axis so that any time t its position is given by $x(t) = \frac{1}{2}\sin t + \cos(2t)$. What is the acceleration of the particle at $t = \frac{\pi}{2}$?

- A) 0
- B) $\frac{1}{2}$
- C) $\frac{3}{2}$
- D) $\frac{5}{2}$
- E) $\frac{7}{2}$

10.

If $f(x) = \cos x \sin 3x$, then $f'\left(\frac{\pi}{6}\right)$ is equal to

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

11.

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

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

12.

If the radius of a sphere is increasing at a rate of 2 inches per second, how fast, in cubic inches per second, is the volume increasing when the radius is 10 inches?

- A) 800π
- B) 800
- C) 3200π
- D) 40π
- E) 80π

13.

If $f(x) = x^3 - x + 3$ and if c is the only real number such that $f(c) = 0$, then c is between

- A) -2 and -1
- B) -1 and 0
- C) 0 and 1
- D) 1 and 2
- E) 2 and 3

14.

A particle moves along the x-axis so that its position at any time $t \geq 0$ is given by $x(t) = 3t^3 - 15t^2 - 24t$. At which time t is the particle at rest?

- A) never B) 0 only C) 2/3 only D) 2/3 and 4 E) 4 only

15.

If $f(x) = x \cdot \sqrt[3]{x}$, then $f'(x) =$

- A) $4x^3$ B) $\frac{3}{7}x^{7/3}$ C) $\frac{4}{3}x^{1/3}$ D) $\frac{1}{3}x^{1/3}$ E) $\frac{1}{3}x^{-2/3}$

16.

If $f(x) = \frac{\sin^2 x}{1 - \cos x}$, then $f'(x) =$

- A) $\cos x$ B) $\sin x$ C) $-\sin x$ D) $-\cos x$ E) $2\cos x$

17.

$\lim_{x \rightarrow +\infty} \frac{x - \frac{1}{2x}}{2x + \frac{1}{6x}}$ is

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

18.

The $\lim_{h \rightarrow 0} \frac{(x+h)^3 - x^3}{h}$ at the point $x=2$ is

- A) 36 B) 12 C) 8 D) 2 E) 0

19.

At what point on the curve $x^3 - y^2 + x^2 = 0$ is the tangent line vertical?

- (A) (0,0) only
(B) (-1, 0) only
(C) $(1, \sqrt{2})$ only
(D) (-1, 0) and (0, 0)
(E) The tangent line is never vertical.

20.

If $x + y = xy$, then $\frac{dy}{dx}$ is

- (A) $\frac{1}{x-1}$ (B) $\frac{y-1}{x-1}$ (C) $\frac{1-y}{x-1}$ (D) $x+y-1$ (E) $\frac{2-xy}{y}$

21.

Suppose that f is a continuous function defined for all real numbers x and

$$f(-5)=3 \text{ and } f(-1)=-2.$$

If $f(x)=0$ for one and only one value of x , then which of the following could be x ?

- (A) -7
- (B) -2
- (C) 0
- (D) 1
- (E) 2

22.

If $f(x) = (2 + 3x)^4$, then the fourth derivative of f is

- (A) 0
- (B) $4!(3)$
- (C) $4!(3^4)$
- (D) $4!(3^5)$
- (E) $4!(2+3x)$

23.

What is the 50th derivative of $\cos x$?

- (A) $-\cos x$
- (B) $\cos x$
- (C) $\sin x$
- (D) $-\sin x$
- (E) 0

24.

Let f and g be differentiable functions such that

$$f(1) = 4, \quad g(1) = 3, \quad f'(3) = -5$$

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

If $h(x) = f(g(x))$, then $h'(1) =$

- (A) -9
- (B) 15
- (C) 0
- (D) -5
- (E) -12

25.

A particle moves along the x -axis in such a way that its position at time t is given by $x(t) = \frac{1-t}{1+t}$. What is the acceleration of the particle at time $t = 0$?

- (A) $-\frac{3}{5}$
- (B) -4
- (C) 4
- (D) 2
- (E) -2

26.

The equation of the tangent line to the curve $x^2 + y^2 = 169$ at the point $(5, -12)$ is

- (A) $5y - 12x = -120$
- (B) $5y - 12x = 119$
- (C) $5x - 12y = 169$
- (D) $12x + 5y = 0$
- (E) $12x + 5y = 169$

27.

If $f(x) = \sqrt{4\sin x + 2}$, then $f'(0) =$

- (A) -2
- (B) 0
- (C) $\sqrt{2}$
- (D) $\frac{\sqrt{2}}{2}$
- (E) 1

28.

The graph of which function has $y = -1$ as an asymptote?

- (A) $y = e^{-x}$ (B) $y = \frac{-x}{1-x}$ (C) $y = \ln(x+1)$ (D) $y = \frac{x}{x+1}$ (E) $y = \frac{x}{1-x}$

29.

$\lim_{h \rightarrow 0} \frac{\tan 2(x+h) - \tan(2x)}{h}$ is

- (A) 0
- (B) $2 \cot(2x)$
- (C) $\sec^2(2x)$
- (D) $2 \sec^2(2x)$
- (E) nonexistent

30.

$$\lim_{x \rightarrow \infty} \frac{10^8 x^5 + 10^6 x^4 + 10^4 x^2}{10^9 x^6 + 10^7 x^5 + 10^5 x^3} \text{ is}$$

- (A) 0
- (B) 1
- (C) -1
- (D) $\frac{1}{10}$
- (E) $-\frac{1}{10}$

31.

If $f(x) = \frac{x^2 - 9}{x + 3}$ is continuous at $x = -3$, then $f(-3) =$

- (A) 3
- (B) -3
- (C) 0
- (D) 6
- (E) -6

32.

The equation of the line tangent to the curve $y = \frac{kx + 8}{k + x}$ at $x = -2$ is $y = x + 4$. What is the value of k ?

- (A) -3
- (B) -1
- (C) 1
- (D) 3
- (E) 4

33.

If $x^2 y + yx^2 = 6$, then $\frac{d^2 y}{dx^2}$ at the point $(1, 3)$ is

- (A) -18
- (B) -6
- (C) 6
- (D) 12
- (E) 18

Chapter 2 MC Questions Part II

1)

An equation for a tangent to the graph of $y = \arcsin \frac{x}{2}$ at the origin is

- (A) $x - 2y = 0$ (B) $x - y = 0$ (C) $x = 0$ (D) $y = 0$ (E) $\pi x - 2y = 0$

2)

If $f(x) = \sin(e^{-x})$, then $f'(x) =$

- (A) $-\cos(e^{-x})$
(B) $\cos(e^{-x}) + e^{-x}$
(C) $\cos(e^{-x}) - e^{-x}$
(D) $e^{-x} \cos(e^{-x})$
(E) $-e^{-x} \cos(e^{-x})$

3)

If $y = \arctan(e^{2x})$, then $\frac{dy}{dx} =$

- (A) $\frac{2e^{2x}}{\sqrt{1-e^{4x}}}$ (B) $\frac{2e^{2x}}{1+e^{4x}}$ (C) $\frac{e^{2x}}{1+e^{4x}}$ (D) $\frac{1}{\sqrt{1-e^{4x}}}$ (E) $\frac{1}{1+e^{4x}}$

4)

The slope of the line tangent to the graph of $y = \ln(x^2)$ at $x = e^2$ is

- (A) $\frac{1}{e^2}$ (B) $\frac{2}{e^2}$ (C) $\frac{4}{e^2}$ (D) $\frac{1}{e^4}$ (E) $\frac{4}{e^4}$

5)

$$\frac{d}{dx}(\arcsin 2x) =$$

(A) $\frac{-1}{2\sqrt{1-4x^2}}$

(B) $\frac{-2}{\sqrt{4x^2-1}}$

(C) $\frac{1}{2\sqrt{1-4x^2}}$

(D) $\frac{2}{\sqrt{1-4x^2}}$

(E) $\frac{2}{\sqrt{4x^2-1}}$

6)

Suppose $f(x) = 2x^3 - 3x$. If $h(x)$ is the inverse of f , then $h'(-1) =$

(A) -1 (B) 1/5 (C) 1/3 (D) 1 (E) 3

7)

If $f(x) = e^{1/x}$, then $f'(x) =$

(A) $-\frac{e^{1/x}}{x^2}$

(B) $-e^{1/x}$

(C) $\frac{e^{1/x}}{x}$

(D) $\frac{e^{1/x}}{x^2}$

(E) $\frac{1}{x}e^{(1/x)-1}$

8)

If $y = 10^{(x^2-1)}$, then $\frac{dy}{dx} =$

(A) $(\ln 10)10^{(x^2-1)}$

(B) $(2x)10^{(x^2-1)}$

(C) $(x^2-1)10^{(x^2-2)}$

(D) $2x(\ln 10)10^{(x^2-1)}$

(E) $x^2(\ln 10)10^{(x^2-1)}$

9)

If $y = \frac{\ln x}{x}$, then $\frac{dy}{dx} =$

(A) $\frac{1}{x}$

(B) $\frac{1}{x^2}$

(C) $\frac{\ln x - 1}{x^2}$

(D) $\frac{1 - \ln x}{x^2}$

(E) $\frac{1 + \ln x}{x^2}$

10)

If $f(x) = \frac{e^{2x}}{2x}$, then $f'(x) =$

(A) 1

(B) $\frac{e^{2x}(1-2x)}{2x^2}$

(C) e^{2x}

(D) $\frac{e^{2x}(2x+1)}{x^2}$

(E) $\frac{e^{2x}(2x-1)}{2x^2}$

11)

$$\frac{d}{dx}(\ln e^{2x}) =$$

(A) $\frac{1}{e^{2x}}$

(B) $\frac{2}{e^{2x}}$

(C) $2x$

(D) 1

(E) 2

12)

Suppose $f(1) = 2$, $f'(1) = 5$, and $f'(2) = 4$. Find $(f^{-1})'(2)$.

(A) $\frac{1}{5}$

(B) $-\frac{1}{5}$

(C) $\frac{1}{4}$

(D) $-\frac{1}{4}$

(E) none of these

13)

$$\frac{d}{dx} \ln\left(\frac{1}{1-x}\right) =$$

(A) $\frac{1}{1-x}$

(B) $\frac{1}{x-1}$

(C) $1-x$

(D) $x-1$

(E) $(1-x)^2$

1. B
2. C
3. A
4. B
5. E
6. E
7. D
8. A
9. E
10. E
11. A
12. A
13. A
14. E
15. C
16. C
17. D
18. B
19. D
20. C
21. B
22. C
23. A
24. B
25. C
26. C
27. C
28. E
29. D
30. A
31. E
32. D
33. E

Answers Part II

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