

1. 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) $\frac{4}{e^4}$

A ☐ 1

B ☒ 4

C ☐ 0

D ☐ 8

E ☐ 2

derivative

$$y' = \frac{1}{x^2} (2x) = \frac{2x}{x^2} = \frac{2}{x}$$

$$y = \ln(x^2) = 2 \ln(x)$$

2. If $f(x) = x + \sin x$, then $f'(x) =$

(A) $1 + \cos x$

(B) $1 - \cos x$

(C) $\cos x$

(D) $\sin x - x \cos x$

(E) $\sin x + x \cos x$

A ☒ 13

B ☐ 2

C ☐ 0

D ☐ 0

E ☐ 0

3. If $f(x) = e^x$, which of the following lines is an asymptote to the graph of f ?

(A) $y = 0$

(B) $x = 0$

(C) $y = x$

(D) $y = -x$

(E) $y = 1$

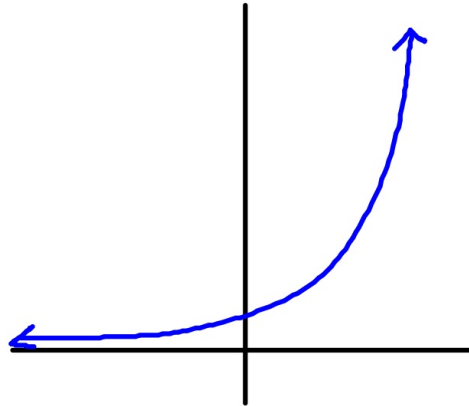
A ☒ 5

B ☐ 6

C ☐ 1

D ☐ 2

E ☐ 1



4. If $f(x) = \frac{x-1}{x+1}$ for all $x \neq -1$, then $f'(1) =$

(A) -1

(B) $-\frac{1}{2}$

(C) 0

(D) $\frac{1}{2}$

(E) 1

A ☐ 1

B ☐ 1

C ☐ 3

D ☒ 4

E ☐ 6

$$f'(x) = \frac{1(x+1) - 1(x-1)}{(x+1)^2}$$

$$f'(1) = \frac{2-0}{2^2} = \frac{2}{4} = \frac{1}{2}$$

5. If $y = \cos^2 3x$, then $\frac{dy}{dx} =$

- (A) $-6 \sin 3x \cos 3x$ (B) $-2 \cos 3x$ (C) $2 \cos 3x$ (D) $6 \cos 3x$ (E) $2 \sin 3x \cos 3x$

- A ☒ 7
B ☐ 0
C ☐ 0
D ☐ 1
E ☐ 7

$$\frac{dy}{dx} = 2(\cos(3x))(-\sin(3x))(3)$$

6. If $f(x) = 2x^3 + Ax^2 + Bx - 5$ and if $f(2) = 3$ and $f(-2) = -37$, what is the value of $A + B$?

- (A) -6 (B) -3 (C) -1 (D) 2 (E) It cannot be determined from the information given.

- A ☐ 5
B ☐ 1
C ☒ 5
D ☐ 0
E ☐ 4

$$\begin{aligned} 3 &= 2(2)^3 + A(2)^2 + B(2) - 5 \\ -37 &= 2(-2)^3 + A(-2)^2 + B(-2) - 5 \\ \hline -34 &= 0 + 8A + 0 - 10 \\ -34 &= 8A - 10 \\ -24 &= 8A \\ -3 &= A \\ -8 &= 4A + 2B \\ -8 &= 4(-3) + 2B \\ -8 &= -12 + 2B \rightarrow 4 = 2B \rightarrow B = 2 \end{aligned}$$

7. Let $f(x) = \left| \sin x - \frac{1}{2} \right|$. The maximum value attained by f is

(A) $\frac{1}{2}$

(B) 1

(C) $\frac{3}{2}$

(D) $\frac{\pi}{2}$

(E) $\frac{3\pi}{2}$

A  6

B  0

C  5

D  0

E  3

8. If $f(x) = \ln(\ln x)$, then $f'(x) =$

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

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

(C) $\frac{\ln x}{x}$

(D) x

(E) $\frac{1}{x \ln x}$

A  1

B  1

C  1

D  2

E  9

9. The table below shows the rate in liters/min at which water leaked out of a container.

Time (min)	0	1.2	2.3	3.8	5.4
Rate (liters/min)	5.6	4.3	3.1	2.2	1.5

Use a right-hand Riemann sum with four subintervals to estimate the total amount of water that has leaked out of the container.

- (A) 12.70 liters (B) 14.27 liters (C) 16.70 liters (D) 16.95 liters (E) 19.62 liters

A 0

B  12

C 0

D  1

E  1

$$1.2(4.3) + 1.1(3.1) + 1.5(2.2) + 1.6(1.5)$$

10. Suppose that f and g are continuous functions and that

$$\int_2^6 f(x) dx = 5$$

$$\int_2^6 g(x) dx = -3$$

$$\int_2^{10} g(x) dx = 7.$$

Which of the following must be true?

✓ I. $\int_2^6 -4g(x) dx = 12$

II. $\int_2^6 f(x) \cdot g(x) dx = -15$

✓ III. $\int_2^6 f(x) - g(x) dx = 8$

A  1

B  3

C  2

D  7

E  1

(A) I and II only

(B) I and III only

(C) II and III only

(D) I, II, and III

(E) none