

Please Mark Your Answers With a Nice Circle ○ NOT X!

Q1 Let $F(x) = \int_1^x \sqrt{\cos t + 3}$. Find $F'(0)$.

- (A) -1 (C) 2 (E) None
(B) 1 (D) $\sqrt{13}$

Q2 Find the average value of the function $h(x) = e^x$ on the interval $[1, 3]$?

- (A) $\frac{3e-1}{4}$ (C) $\frac{2e^2-1}{3}$ (E) None
(B) $260e/9$ (D) $\frac{e^3-e}{2}$

Q3 Evaluate the integral $\int_0^{\sqrt{13}} \sqrt{13-x^2} dx$

- (A) $-\pi$ (C) 13π (E) None
(B) $13\pi/4$ (D) 2π

Q4 Use the following table of values to find $(f \circ g)'(2)$

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	-3	7	2	-4
2	1	8	1	5

- (A) -11 (C) -26 (E) None
(B) 35 (D) 54

Q5 The value of $\lim_{x \rightarrow 1} \frac{e^x - x - 1}{\cos x - 1}$ is

- (A) -1 (C) -2 (E) None
(B) $1/2$ (D) DNE

Q6 Find the maximum value of $f(x) = x^3 - 3x + 1$ on the interval $[0, 3]$.

- (A) 0 (C) 21 (E) None
(B) -1 (D) 19

Q7 Given $f''(x) = \frac{x+3}{x-5}$. Find the intervals where $f(x)$ is concave downward.

- (A) $(-\infty, 3)$ (C) $(-\infty, 5)$ (E) None
(B) $(-3, 5)$ (D) $(5, \infty)$

Q8 The slope of the line tangent to the graph of $y = x^3 - x^2 + 1$ at $x = 2$ is

- (A) 7 (C) 11 (E) None
(B) 8 (D) 12

Q9 Evaluate the limit $\lim_{n \rightarrow \infty} \frac{1^2 + 2^2 + 3^2 \dots + n^2}{n^3}$

- (A) $\frac{1}{3}$ (C) $\frac{3}{2}$ (E) None
(B) 3 (D) 5

Q10 Evaluate the integral $\int_{-2}^2 |x^2 - 4| dx$

- (A) 12 (C) $\frac{32}{3}$ (E) None
(B) 16 (D) $32/3$

Q11 Given $f(x) = \begin{cases} 4x + 2a & \text{if } x \leq 3 \\ 3x^2 - 1 & \text{if } x > 3 \end{cases}$, what value of a will make $f(x)$ continuous at $x = 3$?

- (A) 7 (C) 12 (E) None
(B) 9 (D) 13

Q12 If $f(1) = 1$ and $f(2) = e$ then find $\int_1^2 \frac{f'(x)}{f(x)} dx$

- (A) -1 (C) 1 (E) None
(B) 0 (D) e

Q13 Evaluate the integral $\int \frac{x^4 - x}{x^3} dx$

- (A) $-\frac{1}{2}x^2 + \frac{2}{x} + c$ (C) $\frac{1}{3}x^2 + \frac{2}{x} + c$ (E) None
(B) $\frac{1}{2}x^2 + \frac{1}{x} + c$ (D) $-\frac{3}{2}x^2 + \frac{3}{x} + c$

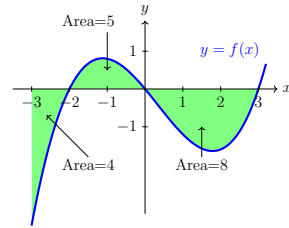
Q14 Let $F(x) = \int_1^x t f(t) dt = \sin(x-2) + e^x$. Then find $f(2)$.

- (A) 1 (C) e^2 (E) None
(B) $1 - e^2$ (D) $\frac{1+e^2}{2}$

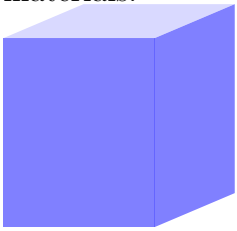
Classical Problems: Show all your work(60pts) .

Q1 The figure below shows the areas of regions bounded by the graph of $f(x)$ and the x - axis for x in the interval $[-3, 3]$.

Find $\int_{-3}^3 f(x)dx =$



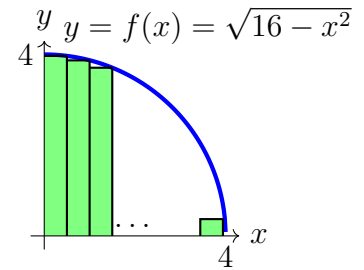
Q2 A television manufacturing firm needs to design an **open-topped box with a square base**. The box must hold 32cm^3 . Find the dimensions of the box that can be built with the **minimum** amount of materials. **Solution:**



Q3 Evaluate the limit: $\lim_{n \rightarrow \infty} \sum_{i=1}^n e^{i\frac{4}{n}} \frac{4}{n}$.

Solution:

Q4 Compute the definite integral $\int_0^4 \sqrt{16 - x^2} dx$ as the limit of a **right Riemann sum**.



Solution: