Question Paper - Calculus

Difficulty: Medium Time: 25

Q1. Determine the derivative of the function $f(x) = x^2 \sin(3x)$ with respect to x.

A) A) $2x \sin(3x) + 3x^2 \cos(3x)$

B) B) $2x \sin(3x) - 3x^2 \cos(3x)$

C) C) $2x \cos(3x) + 3x^2 \sin(3x)$

D) D) $2x \cos(3x) - 3x^2 \sin(3x)$

Q2. Given the equation $x^3 + y^3 = 6xy$, find $\frac{dy}{dx}$ at the point $(3, 3)$.

A) A) -1

B) B) 0

C) C) 1

D) D) 3

Q3. Evaluate the indefinite integral $\int (e^{2x} + \frac{1}{x} - \sec^2(x)) \, dx$.

A) A) $\frac{1}{2}e^{2x} + \ln|x| - \tan(x) + C$

B) B) $2e^{2x} + \ln|x| - \tan(x) + C$

C) C) $\frac{1}{2}e^{2x} - \ln|x| + \tan(x) + C$

D) D) $e^{2x} + \ln|x| - \tan(x) + C$

Q4. Calculate the definite integral $\int_0^1 x \sqrt{1-x^2} \, dx$.

A) A) $\frac{1}{3}$

B) B) $\frac{2}{3}$

C) C) 0

D) D) 1

Q5. A spherical balloon is being inflated. Its volume is increasing at a rate of $10 \, \text{cm}^3/\text{s}$. At

A) A) $\frac{1}{10\pi} \, \text{cm/s}$

B) B) $\frac{1}{20\pi} \, \text{cm/s}$

C) C) $\frac{1}{4\pi} \, \text{cm/s}$

D) D) $\frac{1}{50\pi} \, \text{cm/s}$

Q6. Determine the area of the region bounded by the curve $y = x^2 - 4x$ and the x-axis.

A) A) $\frac{32}{3}$

B) B) $\frac{16}{3}$

C) C) $-\frac{32}{3}$

D) D) 8