

Practice Midterm Examination

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All questions carry equal weight

Question 1.

Evaluate the following integral exactly. Show all your working.

$$\int_1^e x \ln x \, dx.$$

Question 2.

Determine whether the following integral diverges or converges. Justify your answer.

$$\int_1^{\infty} \frac{x}{x^4 + 1} dx$$

Question 3.

Write down the formula for the volume of the solid generated by rotating the curve $y = f(x)$ around the x -axis for $a \leq x \leq b$. Use this formula to find the volume when $f(x) = \sin x + \cos x$ and $0 \leq x \leq \pi/2$.

Question 4.

Write down the formula for the arc length of a curve $y = f(x)$ for $a \leq x \leq b$. Use this to find the length of the curve $y = \frac{2}{3}(x^2 - 1)^{3/2}$ for $1 \leq x \leq 2$.