

MAT 132: Calculus 2
Practice Problems for Midterm 1

Stony Brook University

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Problem 1. Compute the following integrals:

$$\int \left(\frac{1}{2x-3} + e^{-x} \right) dx$$

$$\int_0^{\pi} 2 \cos^2 x dx$$

$$\int_1^2 \frac{x^2}{(x^3+1)^2} dx$$

$$\int \frac{dx}{x\sqrt{\ln x}}$$

$$\int_0^{\pi} 2x \cos(2x) dx$$

Problem 2. Let R denote the region in the plane bounded by the 4 curves $x = -1$, $x = 1$, $y = 0$, and $y = \frac{x+1}{(x+2)(x+4)}$.

- (a) Express the area of R as a definite integral.
- (b) Evaluate the definite integral of part (a).

Problem 3. A particle is moving along the x -axis; its speed at any time $t \geq 0$ is given in terms of t by the formula $\frac{\ln(t+1)}{(t+1)^2}$.

(a) Express the total distance traveled by the particle during the time interval $1 \leq t \leq 3$ as a definite integral.

(b) Evaluate the definite integral of part (a).

Problem 4. Find the arc length of the curve $y = x^{3/2}$, where $0 \leq x \leq 1$.

Problem 5. (a) Draw the region bounded by the curves $y = e^x + 1$, $x = 0$, $x = 1$, and $y = 0$.

(b) Compute the volume when the region is rotated around the x -axis.

Problem 6. For each of the following improper integrals, determine whether it converges or not. If the integral converges, then determine its value.

$$\int_0^{\infty} x e^{-x^2} dx$$

$$\int_{-1}^1 \frac{x}{(1-x)^2} dx$$

Problem 7. Consider a thin rod oriented on the x -axis over the interval $[1, 3]$. If the density of the rod is given by $\rho(x) = 2x^2 + 3$, what is the mass of the rod?

Problem 8. A spring has a natural length of 10 cm. It takes 2 J to stretch the spring to 15 cm. How much work would it take to stretch the spring from 15 cm to 20 cm?