

Midterm #2, 10/28
Math 157 (Calculus II), Fall 2025

Each problem is worth 10 points, for a total of 50 points. You have 50 minutes to do the exam. Remember to *show your work* on all problems!

1. Write, **but do not attempt to evaluate**, a definite integral which computes the arc length of the curve $y = xe^{-x}$ from $x = 1$ to $x = 5$.
2. Compute the surface area of the surface obtained by rotating the curve $y = \sqrt{1 - x^2}$ from $x = 0$ to $x = \frac{1}{2}$ about the x -axis.
3. Consider the parametrized curve given by $x = \sin(2t)$ and $y = \cos(2t)$ for $0 \leq t \leq \frac{\pi}{4}$. Compute the arc length of this curve.
4. Consider the polar curve given by $r = \sqrt{\theta(\pi - 2\theta)}$ for $0 \leq \theta \leq \frac{\pi}{2}$. Compute the area inside of this curve.
5. Consider the polar curve given by $r = \theta$ for $-\pi \leq \theta \leq \pi$. Compute the slope of the tangent to this curve (i.e., $\frac{dy}{dx}$) when $\theta = 0$.