

Midterm #1, 9/30
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! **Write answers on a separate sheet of paper!**

1. Let R be the region under the curve $y = x^2 - 1$ from $x = 1$ to $x = 2$.
 - (a) Compute the volume of the solid obtained by rotating R about the x -axis.
 - (b) Compute the volume of the solid obtained by rotating R about the y -axis.
2. Hooke's Law says that the force needed to maintain a spring stretched a distance x beyond its resting position is $f(x) = \kappa x$, where κ is the spring constant.
Suppose that your spring has a spring constant of $\kappa = 10 \text{ N/m}$ (newtons per meter). What is the work done stretching the spring 3 meters beyond its resting position?
3. Compute the indefinite integral $\int (x^2 - 2x + 3) e^x dx$. (**Hint:** try integration by parts.)
4. Compute the definite integral $\int_0^2 \frac{1}{4 + x^2} dx$. (**Hint:** try a trigonometric substitution.)
Express your answer in the simplest form you can.
5. Compute the indefinite integral $\int \frac{2x + 1}{x^2 - 9} dx$. (**Hint:** try partial fractions.)