Midterm #1, 2/22
Math 157 (Calculus II), Spring 2024

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. Let R be the region under the curve $y = x^2$ from $x = 0$ to $x = 1$.

   (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 $\kappa = 20\,N/m$ (newtons per meter). What is the work done stretching the spring 1.5 meters beyond its resting position?

3. Compute the indefinite integral $\displaystyle\int (3x^2 - 2x + 5)\, e^x \, dx$. (**Hint**: try integration by parts.)

4. Compute the definite integral $\displaystyle\int_0^2 \frac{1}{4 + x^2}\, dx$. (**Hint**: try a trigonometric substitution.) Express your answer in the simplest form you can.

5. Compute the indefinite integral $\displaystyle\int \frac{2x + 3}{x^2 - 9}\, dx$. (**Hint**: try partial fractions.)