Math 252 (Bueler): Quiz 3 **1 February 2024**

Name: _____ _____ / **25**

30 minutes. No aids (book, notes, calculator, internet, etc.) are permitted. Show all work and use proper notation for full credit. Put answers in reasonably-simplified form. 25 points possible.

1. [9 points] For each part below, completely set up, **but do not evaluate**, an integral for the quantity.

a. The area between the graphs of $y = \sin(x^2)$ and $y = 2x + 5$ on the interval $[-1, 1]$.
(*Hint. This is a section 2.1 question, to get started.*)

b. The length of the curve $y = \frac{x^2}{8} - \ln x$ on the interval $1 \le x \le 3$.

c. The area of the surface formed by revolving the graph of $y = 1 - x^4$, on the interval $[-1, 1]$, around the x-axis.

2. [8 points]

a. Sketch the region bounded by the curves $y = e^{-x^2}$, $y = 0$, $x = 1$, and $x = 2$.

b. Use an integral to compute the volume of the solid found by rotating the region in **a.** around the y-axis. (*Hint. The integral from using washers won't work. Using shells you can do the integral.*)

3. [8 points] A large parabolic radio antenna, a satellite dish like those on West Campus, might have a radius of 3 m and a depth of 1 m. A design engineer would need to know the surface area to determine how much material is needed to build one.

a. Rotate the curve $y = \dfrac{x^2}{9}$, $0 \le x \le 3$, around the y-axis to create a surface. Sketch the curve and the surface.

b. Use an integral compute the surface area. Simplify your answer. (*Hint. Yes, you can do the integral!*)

EC. [1 points] (**Extra Credit**) Though I do not know how to find the antiderivatives in problems **1a** and **1c**, the integral in **1b** can be computed exactly. Do so.

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