Name: _____ Quiz 4

Math F252X-901, Calculus II Fall 2024

Thirty minutes maximum. No aids (book, notes, calculator, phone, etc.) are permitted. Show all work and use proper notation for full credit. Answers should be in reasonably simplified form.

1. (8 points.) A 3 meter long whip antenna has linear density $\rho(x) = 5 - \dfrac{1}{x+1}$ grams per centimeter (starting at $x = 0$). Determine the mass of the antenna. Include units.

2. (8 points.) A 1 meter spring requires 10 J to stretch the spring to 1.1 m. How much work would it take to stretch the spring from 1 m to 1.2 m?

3. (8 points.) Find the center of mass of a system with the following point masses:

   - m_1 is 5kg, placed at $(-3, 4)$
   - m_2 is 2kg, placed at $(1, 5)$
   - m_3 is 3kg, placed at $(2, -1)$

4. (8 points.) Find the center of mass (or, equivalently, the centroid) for the region bounded by $y = 2x^2$, $y = 0$, $x = 0$, and $x = 1$.

5. (4 points.) (BONUS) Find the center of mass (or, equivalently, the centroid) for the region bounded by $y = \cos(2x)$, $x = -\frac{\pi}{2}$ and $x = \frac{\pi}{2}$