

Answer the following problems and simplify your answers.

1. (22 pts) Let R be the region bounded by the curves $y = x^2 - 2x$ and $y = 2x$.
 - (a) Sketch and shade the region R , labeling the axes, intersection points, and curves.
 - (b) Set up, **but do not evaluate**, an integral with respect to x to find the volume of the solid generated when R is revolved about the line $x = -1$.
 - (c) Set up, **but do not evaluate**, an integral with respect to x to find the volume of the solid generated when R is revolved about the line $y = 8$.
2. (18 pts) Consider the curve $y = \ln(\cos(x))$ on the interval $0 \leq x \leq \pi/4$.
 - (a) Set up, **but do not evaluate**, an integral to find the arc length of this curve. **Fully simplify** ds.
 - (b) The curve is rotated about the x -axis to generate a surface. Set up, **but do not evaluate**, an integral to find the surface area.
3. (24 pts) Assuming a uniform density ρ , find the centroid of the region under the curve $y = \cos(x)$ and above the x -axis with $0 \leq x \leq \pi/2$.
4. (12 pts) A 10 m long chain with a mass of 50 kg hangs vertically from a crane. How much work is required to lift the entire chain to the top? (Use 10 m/s^2 as the acceleration due to gravity).
- 5.