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Complete all of the problems in class. You may work in pairs and use the textbook.

Name and section: _____

Weekly Summary:

- Arc length: (§9.3)
  If a smooth curve with parametric equations $x = f(t), y = g(t), a < t < b$ is traversed exactly once as t increases from a to b then its length is:

$$L = \int_a^b \sqrt{(\frac{dx}{dt})^2 + (\frac{dy}{dt})^2}\, dt$$

- Surface area of revolution: (§9.4)
  Let f be positive and have a continuous derivative. The surface area obtained by rotating the curve $y = f(x), a < x < b$ about the x-axis is:

$$A = \int_a^b 2\pi f(x) \sqrt{1 + (\frac{dy}{dx})^2}\, dx$$

- Moments and Centre of Mass: (§9.5)
  The centre of mass of a plate with surface area A is located at the point $(\bar{x}, \bar{y})$ where:

$$\bar{x} = \frac{1}{A} \int_a^b x f(x) dx$$

$$\bar{y} = \frac{1}{A} \int_a^b \frac{1}{2} f(x)^2 dx$$

Workout Problems:

1. Find the length of the curve: $y = \frac{x^4}{4} + \frac{1}{8x^2}, 1 < x < 3$
2. Find the area of the surface obtained by rotating $y = x^3$ between $x = 0$ and $x = 2$ about the x-axis.
3. Find the centroid of the region bounded by the given curves:

$$y = 3x + 5, y = 0, x = -1, x = 2$$