MATH 2300 – Exam 2 Review Problems

§6.2-6.3: Find the volume of the solid obtained by rotating the region bounded by

$$y = x^2, \quad y = \sqrt{x}$$

about the line $x = 2$

§6.2-6.3: Find the volume of the solid obtained by rotating the region bounded by

$$y = \sqrt{x}, \quad y = \frac{x}{2}$$

about the horizontal line $y = -2$.

§6.4: A spring has a natural length of 15 cm. A force of 10 N is required to stretch the spring to 18 cm. Determine the work required to stretch the spring from 16 cm to 22 cm.

§6.4: An inverted conical tank has height 3 m and top radius 1 m. The tank contains water to a depth of 2 m, measured from the tip at the bottom. Assume that the water has density $\rho = 1000$ kg/m^3 and that gravity is $g = 9.8$ m/s^2. **Set up, but do not evaluate** an integral that computes the work required to pump all of the water out over the top rim of the tank.

§8.3: Compute the center of mass of the region bounded by

$$y = x^2, \quad y = 0, \quad x = 1, \quad \text{and} \quad x = 2.$$

§10.1: Give a parametrization of the upper semicircle

$$x^2 + y^2 = 9, \qquad y \geq 0,$$

traced from $(-3, 0)$ to $(3, 0)$ (left to right). State an interval for t.

§10.2: Find the equation of the tangent line to the parametric curve:

$$x = e^t, \quad y = e^{-t}$$

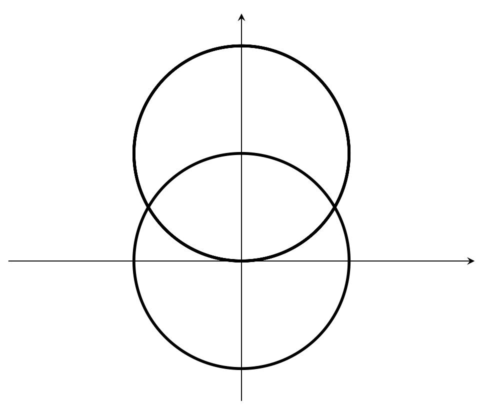
at the point $(1, 1)$.

§10.2: Set up an integral that computes the arc length of the curve defined by

$$x = t^2, \quad y = t^3, \quad 0 \leq t \leq 1.$$

§10.3: Draw the graph of the polar curve $r = \cos(5\theta)$.

§10.4: Find the area inside $r = 6 \sin\theta$ and outside $r = 3$.



§11.1: Determine whether the sequence $a_n = \dfrac{5n + \sin(n)}{n + 10}$. converges or diverges. If it converges, find its limit.

§11.2: Determine whether the series $\displaystyle\sum_{n=1}^{\infty} \frac{5n + \sin(n)}{n + 10}$. converges or diverges. If it converges, find its sum.

§11.2: Suppose a series $\displaystyle\sum_{k=1}^{\infty} a_k$ has nth partial sum

$$S_n = \frac{6n^2 + 3n + 2}{2n^2 + 5n + 1}$$

Does the series converge or diverge? If it converges, find its sum.