

**Due Date:** Wednesday, January 26 at 10AM EST

Carefully read and provide solutions to the problems below, showing all work required to justify any conclusions you make. You are encouraged to collaborate with your classmates, but all solutions turned in should be your own work. If you do collaborate, please record the names of those other students on your submitted work. Finally, your work should be submitted as a PDF on Canvas before the listed due date.

**Textbook problems:** Section 2.1 # 4, 10, 12, 22, 26, 28; Section 2.2 # 2, 12, 16, 20, 24, 28

*Optional textbook problems:* the odd numbered problems from Sections 2.1 and 2.2

**Problem 1.** Sketch the region enclosed by the given curves and find its area.

(a)  $y = e^x, y = xe^x, x = 0$

(b)  $y = \cos x, y = \sin 2x, x = 0, x = \frac{\pi}{2}$

(c)  $y = \sqrt{x}, y = \frac{1}{2}x, x = 9$

**Problem 2.** Use calculus to find the area of the triangle with the given vertices:

$$(0, 0), \quad (3, 1), \quad (1, 2)$$

**Problem 3.** Find the volume of the solid obtained by rotating the region bounded by the given curves about the specified line.

(a)  $y = 2 - \frac{1}{2}x, y = 0, x = 1, x = 2$  about the  $x$ -axis

(b)  $x = 2\sqrt{y}, x = 0, y = 9$  about the  $y$ -axis

**Problem 4.** A bowl is shaped like a hemisphere with diameter 30 cm. A heavy ball with diameter 10 cm is placed in the bowl and water is poured into the bowl to a depth of  $h$  centimeters. Find the volume of water in the bowl.