

Written Homework #3**Due at start of class Monday, 5 February.**

This Written Homework has problems from sections 6.4, 7.1, and 7.2. It is also a “work sheet” to do during the recitation section on Tuesday 30 January. Please work on it with other students! The submitted version must be written by you. You must show your work for full credit.

1. A circular swimming pool has a diameter of 18 ft, the sides are 5 ft high, and the depth of the water is 4 ft. Using the fact that water weighs $62.5 \text{ lb} / \text{ft}^3$, how much work is required to pump all the water over the side? (*Note that the answer has units of ft-lb.*)

2. Evaluate the integral:

$$\int z^4 e^z dz =$$

3. Evaluate the integral:

$$\int e^{-\theta} \cos 2\theta \, d\theta =$$

4. Evaluate the integral:

$$\int (\arcsin x)^2 \, dx =$$

5. Evaluate the integral:

$$\int_1^2 x^3 (\ln x)^2 \, dx =$$

6. Use the method of cylindrical shells to find the volume of the solid of revolution generated by rotating the region bounded by the given curves about the y -axis:

$$y = e^x, \quad y = e^{-x}, \quad x = 2$$

7. Evaluate the integral:

$$\int_0^{\pi} \sin^2 t \cos^4 t \, dt =$$

8. Evaluate the integral:

$$\int \tan x \sec^3 x \, dx =$$

9. Suppose n, m are positive integers. Prove this formula:

$$\int_{-\pi}^{\pi} \sin mx \sin nx \, dx = \begin{cases} 0 & \text{if } m \neq n, \\ \pi & \text{if } m = n \end{cases}$$