MAT126, Paper Homework 6

1. A spherical ball of radius 2" is placed in a bowl in the shape of a half-sphere of radius 4". If the bowl is filled with water to a depth of 3", calculate the volume of water needed.

   Hint: Think of the bowl as being described by rotating part of the circle \( x^2 + (y - 4)^2 = 16 \) around the \( y \)-axis, and the ball as being obtained by revolving the circle \( x^2 + (y - 2)^2 = 4 \) around the \( y \)-axis.

2. Write an integral that represents the length of the curve \( y = \sin(x) \) for \( 0 \leq x \leq \pi \).

   Use Simpson’s rule with \( n = 4 \) to approximate the value of the integral, correct to 3 decimal places.