Week 3 in Review

courtesy: David J. Manuel

(covering 6.3 and 6.4)

(Problems with a * beside them will also be done in Python)

1 Section 6.3

1. Find the volume of the solid formed by rotating the given region about the given line:

   (a) $y = 6x - x^2, y = 0$ about the y-axis

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

   (c) $y^2 = 3x, y = x$ about the x-axis

   (d) $x = 0$, $y = 2\sin(x)$, $y = \sec(x)$ about the x-axis *

   (e) $y = \ln(x)$, the x-axis, the y-axis, and $y = 2$ about the line $x = -1$

   (f) $y = 4 - x^2$ and the x-axis about the line $x = -4$

   (g) $x = 2y^3, x = 4y^2$, about the line $y = -2$

2. DERIVE the formula for the volume of a cone of radius R and height H.

2 Section 6.4

1. A spring has a natural length of 2m. If a force of 27 N is required to hold the spring at a length of 5m, how much work is done stretching the spring from a length of 3m to a length of 4m?

2. A spring has a natural length of 2 m. It requires 27 J of work to stretch the spring from a length of 2m to a length of 5m. How much work is done stretching the spring from a length of 3m to a length of 4m? *

3. A 20-ft rope weighing 4 lb/ft is hanging off a cliff with a 30 lb weight attached. How much work is required to lift the whole rope and weight to the top of the cliff?

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Math 152 - Spring 2023
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4. A tank has the shape of a circular cone with its vertex at the bottom and it is filled with water. If the radius of the base is 2m and the height of the cone is 5m, find the work done in pumping all of the water to the top of the tank. Use ρg for the weight density.

5. Consider the tank shown below, which is full of water of weight density ρg. The end of the tank is in the shape of a semi-circle with radius 3 feet. Set up the integral that gives the work required to pump the water out of a 1 foot high spout at the top of the tank.*