Spring 2020 Math 152

Week in Review III

courtesy: David J. Manuel

(covering 6.2, 6.3, 6.4)

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

1   Section 6.2-6.3

1. Find the volume of a square pyramid whose height is h and whose base is s by s.

2. The base of a solid is the unit circle in the x-y plane. Cross-sections perpendicular to the x-axis are equilateral triangles. Find the volume of the solid.Find the volume of the solid formed by rotating the region bounded by $y = -2 + 3x - x^2$ and $y = 0$ about the y-axis.

3. Find the volume of the solid formed by rotating the region bounded by the curves $y = \sqrt{x}$, $x = 0$, and $y = 2$ about the x-axis.

4. Find the volume of the solid formed by rotating the region in the previous example about the line $y = -1$.

5. Find the volume of the solid formed by rotating the region bounded by $y = \ln x$, $y = 0$, and $x = e^2$ about the line $x = -1$. *

6. Set up, but do not compute, an integral to find the volume of the solid obtained by rotating the region bounded by $x = 4 - y^2$ and $x = 8 - 2y^2$ about the x-axis.*

2   Section 6.4

1. A spring has a natural length of 3 meters. A force of 10 N is required to keep the spring stretched an additional 50 cm. Find the amount of work required to stretch the spring from its natural length to a length of 5m.

2. A spring has a natural length of 3 meters. The work required to stretch the spring an additional 50 cm is 10 Joules. Find the amount of work required to stretch the spring from its natural length to a length of 5m.

3. A tank in the shape of a rectangular prism 6m long, 2m wide, and 1m tall is full of water (density 1000 kg/m^3). Find the work required to pump half of the water out of the tank.

4. Suppose the tank in the previous problem instead has ends in the shape of isosceles triangles with a height of 1m and a base across the top of 2m. Find the work required to pump all the water out of the tank.

5. Now suppose the tank in #3 has ends in the shape of a semicircle (lower half) of radius 2m. A spout extends 0.5m above the top of the tank. If the tank is full of water, find the amount of work required to pump all the water out of the tank.*

6. An 800-lb steel beam hangs from a 50-foot cable which weighs 6 pounds/foot. Find the work done in winding 20 feet of the cable about a steel drum.