Spring 2019 Math 152

Week in Review 3

courtesy: Amy Austin

(covering section 6.3-6.4)

Section 6.3

1. Find the volume of the solid obtained by rotating the region bounded by the given curve(s) about the specified axis.

   a.) $y = 10x - x^2$, $y = 0$ about the y axis.

   b.) $y = x^3$, $y = 0$, $x = 1$, $x = 2$, about the line $x = -1$.

   c.) $y = x^2$ and $y = 4 - x^2$, about the line $x = \sqrt{2}$.

2. Using two different methods, set up but do not evaluate the integral that gives the volume of the solid obtained by rotating the region bounded by $y = x^2$, $y = 3x$, about the y axis.

3. Using two different methods, set up but do not evaluate the integral that gives the volume of the solid obtained by rotating the region bounded by $y = \sqrt{x}$, $x = 0$, $x = 4$, $y = 0$, about the line $y = 3$.

Section 6.4

4. How much work is done in lifting a 30 lb barbell from the floor to a height of 4 feet?

5. When a particle is at a distance x meters from the origin, a force of $f(x) = 3x^2 + 2$ Newtons acts on it. How much work is done in moving the object from $x = 2$ to $x = 4$?

6. A spring has a natural length of 6 inches. If a 5-lb force is required to maintain it to a length of 18 inches, how much work is required to stretch it from 1 foot to 3 feet?

7. Suppose the work needed to stretch a spring from its natural length to a length of 5 feet beyond its natural length is 30 ft-lb.

   a.) How much work is done in stretching the spring from 3 feet beyond its natural length to 120 inches beyind its natural length?

   b.) How far beyond its natural length will a force of 60 lb keep the spring stretched?

8. A heavy rope, 50 feet long, weighs 0.5 pounds per foot and hangs over the edge of a building 120 feet high. How much work is done in pulling the rope to the top of the building?

9. A 200 pound cable is 300 feet long and hangs vertically from the top of a tall building. How much work is required to pull 20 feet of the cable to the top of the building?

10. An aquarium 10 m long, 2 m wide and 8 m deep is full of water. Find the work required to pump the top 3 feet of water to the top of the aquarium.

11. A tank contains water and has the shape of a trough 6 feet long. The end of the trough is an isosceles triangle with height 3 feet and base length 4 feet. The vertex of the triangle is at the bottom. Find the work required to pump all of the water to the top of the tank.

12. A tank in the shape of sphere with radius 4 m is half full of water. The water is pumped from a spout at the top of the tank that is 1 m high. Set up but do not evaluate an integral done in pumping the water through the spout. CLEARLY MARK YOUR AXIS AND WHAT DIRECTION IS POSITIVE!

13. A tank in the shape of cone with radius 1 inch and height 15 inches is full of water to a depth of 7 inches. Set up but do not evaluate an integral done in pumping the water through the spout. CLEARLY MARK YOUR AXIS AND WHAT DIRECTION IS POSITIVE!