

1. LENGHT PROBLEMS, DENSITY PROBLEMS AND APPLICATIONS TO PHYSICS

Solve the following problems. Include an illustration of the variable.

1 Consider the region bounded by the  $x$  axis,  $y = 3 - x$  and  $y = 3 + x$ . If the density is  $\delta(x) = 1 + x$ , find the total mass of the region.

2. Consider the region in quadrant I, bounded by the  $y$  axis,  $y = x^2$  and  $y = 2 - x$ . If the density is  $\delta(x) = 2 + x$ , find the total mass of the region.

3. An object travels along the curve given below. Find the total length traveled.  
 $x = 4 \cos(2t), \quad y = 4 \sin(2t) \quad 0 \leq t \leq \pi.$

4. A cylindrical tank with radius 4 ft and height 10 ft contains muddy water. The depth of the muddy water in the tank is 6 ft. The density of the water at a depth of  $h$  ft below the surface is given by  $\delta(h) = kh \text{ lbs}/\text{ft}^3$ , where  $k$  is a positive constant. How much work is needed to pump the muddy water out over the top of the tank?

5. A cubic tank with length 6 ft, width 4 ft and height 10 ft, contains  $48 \text{ ft}^3$  of water. How much work is needed to pump all the water out of the tank? (The density of water is  $62.4 \text{ lbs}/\text{ft}^3$ .)

6. A cone with radius 2 ft and height 8 ft, pointing downward, contains water. The depth of water in the cone is 3 ft. How much work is needed to pump all the water out over the top?