1. Find the mass of a bar on the interval $0 \le x \le 9$ with a density (in *g/cm*) given by $\rho(x) = 3 + 2\sqrt{x}$

2. Find the mass of a 3-*m* bar on the interval $0 \le x \le 3$ with a density (in *g/m*) given by $\rho(x) = 150e^{-x/3}$

3. Find the mass of a bar on the interval $0 \le x \le 6$ with a density

$$\rho(x) = \begin{cases} 1 & \text{if} \quad 0 \le x < 2 \\ 2 & \text{if} \quad 2 \le x < 4 \\ 4 & \text{if} \quad 4 \le x \le 6 \end{cases}$$

4. It takes 50 *J* of work to stretch a spring 0.2 *m* from its equilibrium position. How much work is needed to stretch it an additional 0.5 *m*?

5. It takes 50 *N* of force to stretch a spring 0.2 *m* from its equilibrium position. How much work is needed to stretch it an additional 0.5 *m*?

6. A cylindrical water tank has a height of 6 *m* and a radius of 4 *m*. how much work is required to empty the full tank by pumping the water to an outflow pipe at the top of the tank?

7. Find the total force on the face of a semicircular dam with a radius of 20 *m* when its reservoir is full of water. The diameter of the semicircle is the top of the dam.