Section 6.5

1. **Stretching a spring.** If a force on 90 N stretches a spring 1 m beyond its natural length, how much work does it take to stretch the spring 5 m beyond its natural length?

2. **Force of attraction.** When a particle of mass \( m \) is at \((x, 0)\), it is attracted toward the origin with a force whose magnitude is \( \frac{k}{x^2} \). If the particle starts from rest at \( x = b \) and is acted on by no other forces, find the work done on it by time it reaches \( x = a, \ 0 < a < b \).

3. Problem 13 on page 399 of the text.

4. **Forcing electrons together.** Two electrons \( r \) meters apart repel each other with a force of \( F = \frac{23 \times 10^{-29}}{r^2} \) newtons.

   (a) Suppose one electron is held fixed at the point \((1, 0)\) on the \( x \)-axis (units in meters). How much work does it take to move a second electron along the \( x \)-axis from the point \((-1, 0)\) to the origin?

   (b) Suppose an electron is held fixed at each of the points \((-1, 0)\) and \((1, 0)\). How much work does it take to move a third electron along the \( x \)-axis from \((5, 0)\) to \((3, 0)\)?

Mass Problems

1. Find the mass of the triangular region below. All lengths are in meters, and the density of the region is given by \( \delta(x, y) = x \) grams/m\(^2\).

   ![Triangle](image)

2. Find the mass of the triangle in question 1 if the density is \( \delta(x, y) = e^{(x+y)^2} \) grams/m\(^2\).

   (Hint: divide the region into diagonal strips.)

3. A thin plate occupies the region of the plane bounded by the circle \( x^2 + y^2 = 1 \). Find the total mass if the density at the point \((x, y)\) is given by \( \delta(x, y) = \frac{1}{\sqrt{x^2+y^2}} \). (Hint: divide the region into thin circular “rings” centered at the origin.)
4. The region bounded by the graph of $y = x^2$ and the $x$-axis, between 0 and 1, is revolved about the $x$-axis. The resulting solid has density $\delta(x) = x$. Find the total mass.