Worksheet 4: Elastic Potential Energy

1. Solve for each unknown.
   A) A spring with \( k = 450 \text{ N/m} \) is compressed by 0.13 m. How much energy is stored?
   B) A spring with \( k = 520 \text{ N/m} \) stores 7.04 J. How far is it extended from the equilibrium position?
   C) A spring, when compressed 0.20 m from the equilibrium position, stores 26 J. What is the value of the spring constant?

2. The coil springs on a car's suspension have a value of \( k = 6.4 \times 10^4 \text{ N/m} \). When the car strikes a bump the springs briefly compress by 4.0 cm. How much energy is momentarily stored in each spring?

3. A spring attached to a ceiling has a mass of 500.0 g suspended from it such that the spring stretches 4.0 cm. Calculate the spring constant.

4. How much work must be done to
   A) compress a spring 4.0 cm if the spring constant is 55 N/m?
   B) stretch a spring 8.0 cm if the spring constant is 85 N/m?

5. Below is a graph of \( F \) versus \( x \) for an elastic spring. Determine:
   A) the spring constant.
   B) the spring’s maximum amount of elastic potential energy.
   C) the change in elastic potential energy when the spring extends from 3 cm to 4 cm.

6. A spring that obeys Hooke’s law has the following \( F \)-versus-\( x \) graph. How much work is required to stretch the spring
   A) 5.0 cm?
   B) 7.0 cm?

7. A bungee cord needs to transfer \( 2.0 \times 10^6 \text{ J} \) of energy. A 10-kg mass extends the bungee cord 1.3 m. What is the maximum extension of the bungee cord?