11.19. **Model:** Use the definition $F_s = -dU/ds$.

Visualize: Please refer to Figure EX11.19.

Solve: F_x is the negative of the slope of the potential energy graph at position x.

$$F_x = -\left(\frac{dU}{dx}\right)$$

Between $x = 0$ m and $x = 3$ m, the slope is

$$\text{slope} = (U_\text{f} - U_\text{i})/(x_\text{f} - x_\text{i}) = (60\text{ J} - 0\text{ J})/(3\text{ m} - 0\text{ m}) = 20\text{ N}$$

Thus, $F_x = -20$ N at $x = 1$ m. Between $x = 3$ m and $x = 5$ m, the slope is

$$\text{slope} = (U_\text{f} - U_\text{i})/(x_\text{f} - x_\text{i}) = (0\text{ J} - 60\text{ J})/(5\text{ m} - 3\text{ m}) = -30\text{ N}$$

Thus, $F_x = 30$ N at $x = 4$ m.