Solutions

Each answer shows the steps, then the **result**.

2.1

- Hooke's law (size of the force):

$$F = kx = (100\ \text{N m}^{-1})(0.2\ \text{m})$$

- $F = \mathbf{20}\ \text{N}$

2.2

- The force opposes the displacement (points back toward the natural length)

2.3

- Hooke's law, rearranged for k:

$$k = \frac{F}{x} = \frac{12\ \text{N}}{0.03\ \text{m}}$$

- $k = \mathbf{400}\ \text{N m}^{-1}$

2.4

- Spring A (more force for the same stretch means a larger k)

3.1 B

- $F = kx$, proportional to displacement

3.2 B

- the restoring force points back toward the natural length

3.3

(a)

- Hooke's law (size of the force):

$$F = kx = (500\ \text{N m}^{-1})(0.04\ \text{m})$$

- $F = \mathbf{20}\ \text{N}$

(b)

- Opposite to the compression (pushing outward)

3.4

(a)

- at rest the spring force balances the weight:

$$F = mg = (2\ \text{kg})(10\ \text{m s}^{-2}) = \mathbf{20}\ \text{N}$$

(b)

- Hooke's law, rearranged for k:

$$k = \frac{F}{x} = \frac{20\ \text{N}}{0.1\ \text{m}}$$

- $k = \mathbf{200}\ \text{N m}^{-1}$