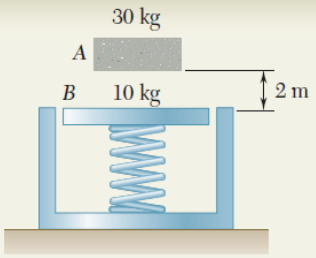
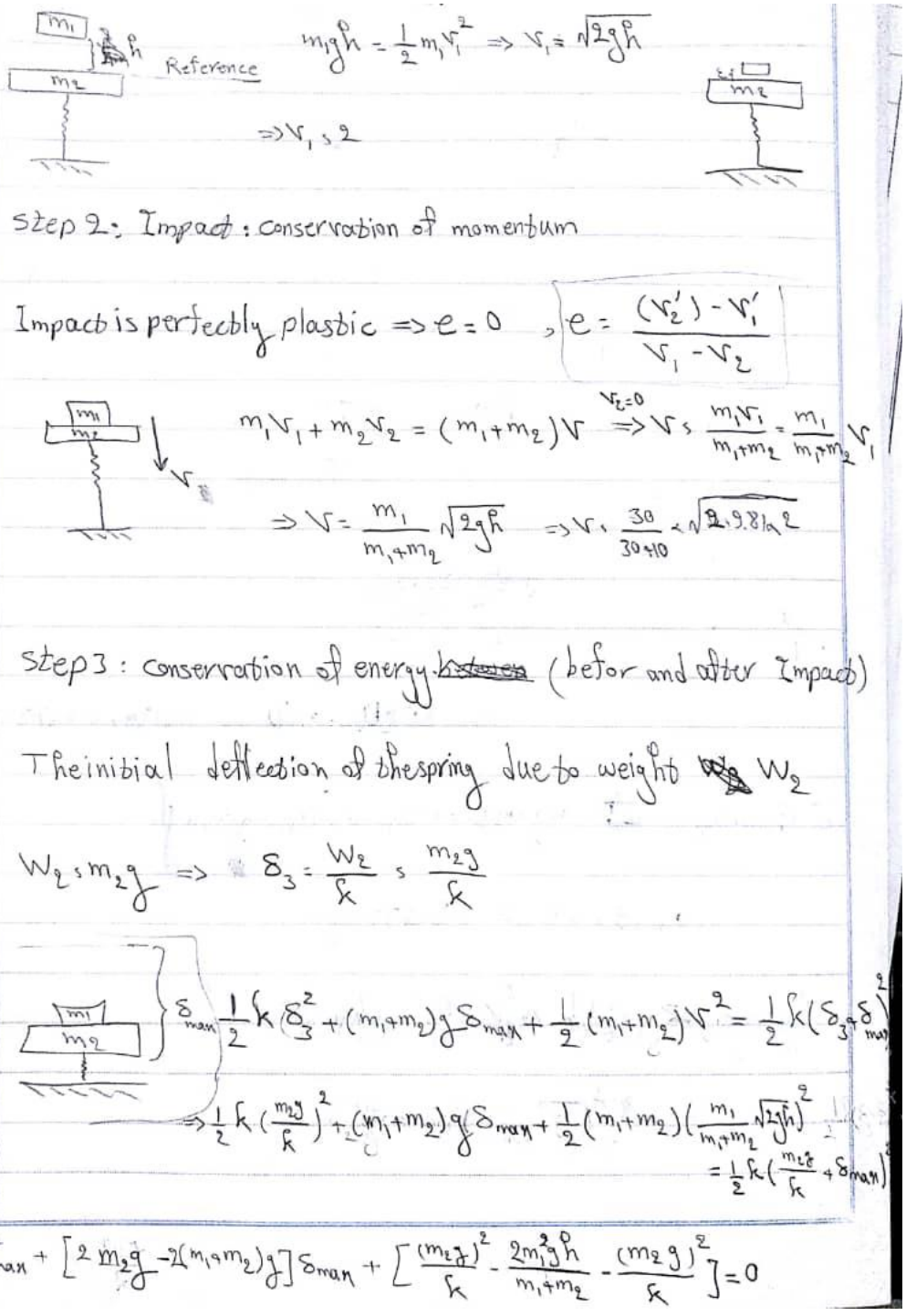


A 30-kg block is dropped from a height of 2 m onto the 10-kg pan of a spring scale. Assuming the impact to be perfectly plastic, determine the maximum deflection of the pan. The constant of the spring is $k = 20$ kN/m.



$$k\delta_{max}^2 - 2m_1 g\,\delta_{max} - \frac{2m_1^2 g h}{m_1+m_2} = 0 \Rightarrow \delta_{max} = \frac{-(-2m_1 g) \pm \sqrt{(-2m_1 g)^2 + 8\frac{m_1^2 g h k}{m_1+m_2}}}{2k}$$

$$\delta_{max} = \frac{-(-2m_1 g) \pm \sqrt{(2m_1 g)^2 + 8\frac{m_1^2 g h k}{m_1+m_2}}}{2k}$$

$$v_1 = \sqrt{2gh} = \sqrt{2\times 9.81\times 2} = 6.2642\ \frac{m}{s}$$

$$v = \frac{m_1}{m_1+m_2}\sqrt{2gh} = \frac{30}{30+10}\sqrt{2\times 9.81\times 2} = 4.6981\ \frac{m}{s}$$

$$\delta_{max} = \frac{-(-2\times 30\times 9.81) \pm \sqrt{(2\times 30\times 9.81) + 8\frac{30^2\times 9.81\times 2\times 20000}{40}}}{40000} = 0.2253\ m.$$

$$\delta_{max} = 0.2253\ m$$