Fred sets up the standard 2-block, 3-spring experiment

$$m = 5 \text{ kg} \quad \text{each block}$$

$$k = 10 \frac{\text{N}}{\text{m}} \quad \text{each spring}$$

He defines normal coordinates

$$s_1 = x_1 + x_2$$

$$s_2 = x_2 - x_1$$

After many measurements, he determines

$$s_1(t) = \underbrace{(0.9798 \text{ m})}_{A_1} \cos\Big(\underbrace{1.4142 \tfrac{\text{rad}}{\text{s}}}_{\omega_1} t \; \underbrace{- 0.6155 \text{ rad}}_{\phi_1} \Big)$$

$$s_2(t) = \underbrace{(2.4221 \text{ m})}_{A_2} \cos\Big(\underbrace{2.4495 \tfrac{\text{rad}}{\text{s}}}_{\omega_2} t \; \underbrace{+ 0.1353 \text{ rad}}_{\phi_2} \Big)$$

One can solve for the positions of the blocks in general:

$$x_1(t) = \frac{1}{2}\Big(s_1(t) - s_2(t)\Big)$$

$$x_2(t) = \frac{1}{2}\Big(s_1(t) + s_2(t)\Big)$$

At time $t=0$, we can evaluate

$$x_1(t=0) = \frac{1}{2}\Big[0.9798 \text{ m} \cos(-0.6155 \text{ rad}) - (2.4221 \text{ m}) \cos(0.1353 \text{ rad})\Big]$$

$$= \boxed{-0.8 \text{ m}}$$

$$x_2(t=0) = \frac{1}{2}\Big[0.9798 \text{ m} \cos(-0.6155 \text{ rad}) + (2.4221 \text{ m}) \cos(0.1353 \text{ rad})\Big]$$

$$= \boxed{+1.6 \text{ m}}$$

In a similar manner, we can find the velocities of the blocks in general:

$$V_1(t) = \frac{1}{2}\left(\frac{ds_1}{dt} - \frac{ds_2}{dt}\right)$$

$$V_2(t) = \frac{1}{2}\left(\frac{ds_1}{dt} + \frac{ds_2}{dt}\right)$$

At time $t=0$, we can evaluate; note

$$\omega_1 = \sqrt{\frac{k}{m}} = 1.41 \text{ rad/s}$$

$$\omega_2 = \sqrt{\frac{3k}{m}} = 2.45 \text{ rad/s}$$

$$V_1(t=0) = \frac{1}{2}\left[\left(-1.41\,\tfrac{rad}{s}\right)(0.9798\text{ m})\sin(-0.6155\text{ rad}) - \left(-2.45\,\tfrac{rad}{s}\right)(2.4221\text{ m})\sin(0.1353\text{ rad})\right]$$

$$= \frac{1}{2}\left[0.8\,\tfrac{m}{s} - \left(-0.8\,\tfrac{m}{s}\right)\right] = \boxed{0.8\,\tfrac{m}{s}}$$

$$V_2(t=0) = \frac{1}{2}\left[\left(-1.41\,\tfrac{rad}{s}\right)(0.9798\text{ m})\sin(-0.6155\text{ rad}) + \left(-2.45\,\tfrac{rad}{s}\right)(2.4221\text{ m})\sin(0.1353\text{ rad})\right]$$

$$= \frac{1}{2}\left[0.8\,\tfrac{m}{s} + \left(-0.8\,\tfrac{m}{s}\right)\right] = \boxed{0.\,\tfrac{m}{s}}$$