$$\begin{aligned} \text{change in position} &= (35\text{ m}) - (30\text{ m}) = 5\text{ m} \\ \text{change in time} &= (1\text{ s}) - (0\text{ s}) = 1\text{ s} \end{aligned}$$

$$\frac{\text{change in position}}{\text{change in time}} = \frac{5\text{ m}}{1\text{ s}} = 5\frac{\text{m}}{\text{s}}$$

$$\text{average velocity} = \frac{\text{change in position}}{\text{change in time}} = 5\frac{\text{m}}{\text{s}}$$

$$x(t) = (5\frac{\text{m}}{\text{s}})\,t \qquad ???$$

$$x(t) = (5\frac{\text{m}}{\text{s}})\,t + 30\text{ m}$$

$$\text{instantaneous velocity} = \frac{dx}{dt}$$

$$v(t) = \frac{d}{dt}\left[(5\frac{\text{m}}{\text{s}})\,t + 30\text{ m}\right]$$

$$x(t) = \int v\,dt$$

$$\begin{aligned} x(t) &= \int (5\frac{\text{m}}{\text{s}})\;dt \\ &= (5\frac{\text{m}}{\text{s}}) \int dt \\ &= (5\frac{\text{m}}{\text{s}})\,t \qquad ??? \end{aligned}$$

$$x(t) = (5\frac{\text{m}}{\text{s}})\,t + C$$

$$\text{instantaneous velocity} \quad v(t) = \frac{dx}{dt}$$

$$\text{change in position} \quad (\text{x}_2 - \text{x}_1) = \int_{t_1}^{t_2} v(t)\,dt$$

$$\text{average acceleration} = \frac{\text{change in velocity}}{\text{change in time}} = 0.6\,\frac{\text{m}}{\text{s}^2}$$

$$v(t) = (0.6\,\frac{\text{m}}{\text{s}^2})\,t - (0.6\,\frac{\text{m}}{\text{s}})$$

$$\text{instantaneous acceleration} \quad = \quad \frac{dv}{dt}$$

$$a(t) \quad = \quad \frac{d}{dt}\left[(0.6\,\frac{\text{m}}{\text{s}^2})\,t \,-\, (0.6\,\frac{\text{m}}{\text{s}}) \right]$$

$$v(t) \quad = \quad \int a\ dt$$

$$a(t) \quad = \quad 9.8\,\frac{\text{m}}{\text{s}^2} \qquad \text{downwards}$$

$$a(t) \quad = \quad -9.8\,\frac{\text{m}}{\text{s}^2}$$

$$v_{\text{blue}}(t) \quad = \quad (-9.8\,\frac{\text{m}}{\text{s}^2})\,t$$

$$v_{\text{green}}(t) \quad = \quad (-9.8\,\frac{\text{m}}{\text{s}^2})\,t$$

$$x(t) \quad = \quad \int v(t)\ dt$$