

$$90. \quad X_0 = 0 \quad X_f - X_i = \int v \, dt$$

$$X_5 = ?$$

$$\text{from } 0 \text{ to } 2: v(t) = 2t$$

$$2 \text{ to } 4: v(t) = 4$$

$$4 \text{ to } 6: v(t) = -2t + 12$$

$$X_2 - X_0 = \int_0^2 2t \, dt$$

$$X_2 - 0 = t^2 \Big|_0^2$$

$$X_2 = 2^2 - 0^2 \quad X_2 = 4 \text{ m}$$

$$X_4 - X_2 = \int_2^4 4 \, dt \quad 4 = 4t^0$$

$$X_4 - 4 = 4t \Big|_2^4$$

$$X_4 - 4 = 4(4) - 4(2)$$

$$X_4 - 4 = 8 \quad X_4 = 12 \text{ m}$$

$$X_5 - X_4 = \int_4^5 (-2t + 12) \, dt$$

$$X_5 - 12 = -t^2 + 12t \Big|_4^5$$

$$X_5 - 12 = \left[-(5)^2 + 12(5) \right] - \left[-(4)^2 + 12(4) \right]$$

$$X_5 - 12 = 35 - 32$$

$$X_5 = 15 \text{ m}$$