

Answer on Question 49738, Physics, Mechanics | Kinematics | Dynamics

Question:

A bird is flying due east. Its distance from a tall building is giving by $x(t) = 28m + \left(12.4 \frac{m}{s}\right)t - \left(0.0450 \frac{m}{s^3}\right)t^3$. What is the instantaneous velocity of the bird when $t = 8s$?

Solution:

From the definition of the instantaneous velocity we have:

$$v(t) = \frac{d}{dt} x(t) = \frac{d}{dt} \left(28m + \left(12.4 \frac{m}{s}\right)t - \left(0.0450 \frac{m}{s^3}\right)t^3 \right) = 12.4 \frac{m}{s} - \left(3 \cdot 0.0450 \frac{m}{s^3}\right) \cdot t^2.$$

When $t = 8s$ the instantaneous velocity of the bird will be:

$$v(8) = 12.4 \frac{m}{s} - 3 \cdot 0.0450 \frac{m}{s^3} \cdot (8s)^2 = 12.4 \frac{m}{s} - 8.64 \frac{m}{s} = 3.76 \frac{m}{s}.$$

Answer:

The instantaneous velocity of the bird when $t = 8s$ is $3.76 \frac{m}{s}$.