General Physics Quarter 1 Week 5 Excercise

AVERAGE VELOCITY AND INSTANTANEOUS VELOCITY

Millano, Rei Benedict L. 12-Laplace 9-18-2022

1. A car travels in a straight line along a road. Its distance x from a stop sign is given as a function of time t by the equation x (t) = at2 – bt3,
   where a = 1.50 m/s2 and b = 0. 500 m/s3. Calculate the average velocity of the car for each time interval:
   a. t = 0 to t = 2.00s
   b. t = 0 to t = 4.00s
   c. t = 2.00s to t = 4.00s

$$F(t_2, t_1) = \frac{\left(\frac{1.5m}{s^2}({t_2}^2) - \frac{0.5m}{s^3}({t_2}^3)\right) - \left(\frac{1.5m}{s^2}({t_1}^2) - \frac{0.5m}{s^3}({t_1}^3)\right)}{t_2 - t_1}$$

a. $F(2{,}0) = \frac{\left(\frac{1.5m}{s^2}(2^2 - 0.52^3\right) - \left(\frac{1.5m}{s^2}(0^2) - \frac{0.5m}{s^3}(0^3)\right)}{2-0}$

$$\frac{\left(\frac{1.5m}{s^2}(4s^2) - \frac{0.5m}{s^3}(8s^3)\right) - 0}{2s}$$

$$\frac{(6m - 4m)}{2s} \rightarrow \quad \frac{2m}{2s}$$

a = $\frac{1m}{s}$

b. $F(4{,}0) = \frac{\left(\frac{1.5m}{s^2}(4^2) - \frac{0.5m}{s^3}(4^3)\right) - \left(\frac{1.5m}{s^2}(0^2) - \frac{0.5m}{s^3}(0^3)\right)}{4-0}$

$$\frac{\left(\frac{1.5m}{s^2}(16s^2) - \frac{0.5m}{s^3}(64s^3)\right) - 0}{4s} \rightarrow \frac{(24m - 32m)}{4s} \rightarrow \quad -\frac{8m}{4s} \rightarrow \quad \frac{2m}{s}$$

c. $F(4{,}2) = \frac{\left(\frac{1.5m}{s^2}(4^2) - \frac{0.5m}{s^3}(4^3)\right) - \left(\frac{1.5m}{s^2}(2^2) - \frac{0.5m}{s^3}(2^3)\right)}{4-2}$

$$\frac{\left(\frac{1.5m}{s^2}(16s^2) - \frac{0.5m}{s^3}(64s^3)\right) - \left(\frac{1.5m}{s^2}(4s^2) - \frac{0.5m}{s^3}(8s^3)\right)}{2s}$$

$$\rightarrow \frac{(24m - 32m) - (6m - 4m)}{2s} \rightarrow \quad -\frac{-8m - 2m}{2s} \rightarrow \quad \frac{-5m}{s}$$

2. A motorcycle rider is stopped at a traffic light. It then travels along a straight road so that its distance from the light is given by the equation x (t) = bt2 – ct3,

where b = 2.40 m/s2 and c = 0.120 m/s3.

Calculate the

a. average velocity of the rider for the time interval t =0 to t= 10.0 s

b. instantaneous velocity at t =0, t= 5.0 s and t =10.0 s

$$F(t_2,t_1) = \frac{\left(\frac{2.4m}{s^2}({t_2}^2) - \frac{0.12m}{s^3}({t_2}^3)\right) - \left(\frac{2.4m}{s^2}({t_1}^2) - \frac{0.12m}{s^3}({t_1}^3)\right)}{t_2 - t_1}$$

a. $F(10{,}2) = \frac{\left(\frac{1.5m}{s^2}(10^2) - \frac{0.5m}{s^3}(10^3)\right) - \left(\frac{1.5m}{s^2}(0^2) - \frac{0.5m}{s^3}(0^3)\right)}{4-0}$

$$\frac{\left(\frac{1.5m}{s^2}(100s^2) - \frac{0.5m}{s^3}(1000s^3)\right) - 0}{4s} \rightarrow \frac{(150m - 500m)}{2s} \rightarrow \frac{-350m}{2s} \rightarrow \frac{175m}{s}$$

$$F(t) = \left(2\frac{2.4m}{s^2}t - 3\frac{0.12m}{s^3}(t^2)\right)$$

b1. $F(0) = \left(2\frac{2.4m}{s^2}0s - 3\frac{0.12m}{s^3}(0^2s^2)\right) \rightarrow \frac{0m}{s} - \frac{0m}{s} \rightarrow \frac{0m}{s}$

b2. $F(5) = \left(2\frac{2.4m}{s^2}5s - 3\frac{0.12m}{s^3}(5^2s^2)\right) \rightarrow \frac{24m}{s} - \frac{9m}{s} \rightarrow \frac{15m}{s}$

b3. $F(10) = \left(2\frac{2.4m}{s^2}10s - 3\frac{0.12m}{s^3}(10^2s^2)\right) \rightarrow \frac{48m}{s} - \frac{36m}{s} \rightarrow \frac{12m}{s}$