Phys 111 Soln HW2

1. 2.1.1 FOC

(b) Displacement is a vector, while distance is not a vector

2. 2.2.3 FOC

(c) $speed_{ave} = 8.0 \frac{km}{h}$; $\vec{V}_{ave} = 0$

3. 2.3.6 FOC

$\vec{V}_0$ $\xrightarrow{t, \vec{a}}$ $\vec{V}_f$

$\vec{V}_0 = 80.0 \frac{km}{h}$ E

$\vec{V}_f = 65.0 \frac{km}{h}$ E

$$\vec{a}_{ave} = \frac{\vec{V}_f - \vec{V}_0}{t} = \frac{(65-80)\frac{km}{h} \text{ E}}{1.5\ h}$$

$$\vec{a}_{ave} = \frac{15.0\ km/h}{1.5\ h} \text{ W} = \boxed{10.0 \frac{km}{h^2} \text{ W}}$$

(a)

4. Prob. 2.2.1

$v = 7.6 \times 10^3 \frac{m}{s}$ $\quad \Delta t = 110\,ms$

$1\ ffl = 91.4\,m$ $\quad$ Find Δx in ffl

$$v = \frac{\Delta x}{\Delta t} \rightarrow \Delta x = v\,\Delta t$$

$$\Delta x = \left(7.6 \times 10^3 \frac{m}{s}\right)(110\,ms)\left[\frac{1\ s}{1000\,ms} \cdot \frac{1\ ffl}{91.4\,m}\right]$$

($1000 = 10^3$)

$$\Delta x = \frac{7.6\,(110)}{91.4}\ ffl$$

$$\boxed{\Delta x \cong 9.1\ ffl}$$

5. Prob. 2.2.5

$\vec{V}_{ave} = \frac{\Delta \vec{x}}{\Delta t}$ for

for $\Delta t = 0.50\,s$

(a) $X_0 = +2.0\,m$, $X_f = +6.0\,m$

(b) $X_0 = +6.0\,m$, $X_f = +2.0\,m$

(c) $X_0 = -3.0\,m$, $X_f = +7.0\,m$

$$\vec{V}_{ave} = \frac{\vec{X}_f - \vec{X}_0}{\Delta t}$$

(a) $\vec{V}_{ave} = \frac{6.0 - 2.0}{0.50} \frac{m}{s} = \boxed{+8.0 \frac{m}{s}}$

(b) $\vec{V}_{ave} = \frac{+2.0 - 6.0}{0.50} \frac{m}{s} = \boxed{-8.0 \frac{m}{s}}$

(c) $\vec{V}_{ave} = \frac{7.0 - (-3.0)}{0.50} \frac{m}{s} = \frac{10.0}{0.50} \frac{m}{s}$

$$\boxed{\vec{V}_{ave} = 20.0 \frac{m}{s}}$$

6. Prob. 2.2.12 [weighted average]

$\vec{v}_1 = 27 \frac{m}{s} N \qquad t_1 = 0.75\,t$

$\vec{v}_2 = 17 \frac{m}{s} S \qquad t_2 = 0.25\,t$

$= -17 \frac{m}{s} N$

$$\bar{x}_w = \frac{\sum_{i=1}^{N} w_i x_i}{\sum_{i=1}^{N} w_i} = \frac{\text{sum of weighted pieces}}{\text{total weight}}$$

$$\vec{v}_{ave} = \frac{t_1 \vec{v}_1 + t_2 \vec{v}_2}{t_1 + t_2}$$

$$= \frac{(0.75t)\left(27 \frac{m}{s}\right) + (0.25t)\left(-17 \frac{m}{s}\right)}{t} N$$

$$\boxed{\vec{v}_{ave} = 16 \frac{m}{s} N}$$

7. Prob. 2.3.19

$\vec{v}_0, \vec{a}, \Delta t$ given solve for $|\vec{v}_f| = v_f$
$\Delta t = 2.0\,s$ for all

$$a = \frac{\Delta v}{\Delta t} \rightarrow \Delta v = a\Delta t \rightarrow \underline{v_f = v_0 + at}$$

(a) $v_0 = +12.0\,\frac{m}{s}$, $a = +3.0\,\frac{m}{s^2}$

$$v_f = 12.0\,\frac{m}{s} + \left(3.0\,\frac{m}{s^2}\right)(2.0\,s)$$

$$\boxed{v_f = 18.0\,\frac{m}{s}}$$

(b) $v_0 = +12.0\,\frac{m}{s}$, $a = -3.0\ m/s^2$

$$v_f = 12.0\,\frac{m}{s} - 6.0\,\frac{m}{s} = \boxed{6.0\,\frac{m}{s}}$$

(c) $v_0 = -12.0\,\frac{m}{s}$, $a = +3.0\ m/s^2$ $\quad \boxed{v_f = -6.0\,\frac{m}{s}}$

(d) $v_0 = -12.0\,\frac{m}{s}$, $a = -3.0\,\frac{m}{s^2}$ $\quad \boxed{v_f = -18.0\,\frac{m}{s}}$