

# Chapter 3 - Motion in 2 and 3 Dimensions

## Physics 206

### Group 1 Problems:

Problem 1a:  $\Delta t = 0.478$  s.

Problem 1b:  $\Delta v = 0$  m/s.

Problem 2a:  $\vec{a}(4) = 20\hat{i} - 7\hat{j}$

Problem 2b:  $\vec{v}(t) = 38\hat{i} - 31\hat{j}$

Problem 2c:  $\vec{r}(4) = 54\hat{i} - 65\hat{j}$

Problem 2d:  $\vec{v}_{ave} = 39\hat{i} - 31\hat{j}$

Problem 2e:  $\theta = 19.3$  degrees below the  $+x$ -axis

Problem 3:  $\Delta t = 0.156$  hr

Problem 4:  $v_0 = L\sqrt{\frac{g}{2h}}$

### Problem 5:

$\theta$	$v_{C/B,x}$	$v_{C/B,y}$
30	2.00	-1.54
45	2.83	-2.17
60	3.46	-3.00
90	4.00	-5.00
120	3.46	-7.00
135	2.83	-7.83
150	2.00	-8.46
180	0.00	-9.00

Problem 6a:  $\vec{v} = -4.25\pi\hat{i}$

Problem 6b:  $\vec{v} = -4.25\pi\hat{j}$

Problem 6c:  $a_{ave} = 134$  m/s<sup>2</sup>

Problem 6d:  $\vec{a}_{ave} = -134\hat{i} + 134\hat{j}$

### Group 2 Problems:

Problem 7a:

$$L = v \cos(30) \frac{v \sin(30) - \sqrt{v^2 \sin^2(30) - 4gD}}{g}$$

### Problem 8:

$$\text{a) } t = \frac{v_p \sin \theta + \sqrt{v_p^2 \sin^2 \theta + 2gh}}{g}$$

$$\text{b) } y_{max} = h + \frac{v_p^2 \sin^2 \theta}{2g}$$

$$\text{c) } \Delta x = v_p \cos \theta \frac{v_p \sin \theta + \sqrt{v_p^2 \sin^2 \theta + 2gh}}{g}$$

Problem 9:  $a = 15.0$  m/s<sup>2</sup>

Problem 10:  $\Delta x = 16.6$  or  $216$  m

Problem 11a: Misses by  $0.1875$  mi in  $0.0625$  hr

Problem 11b and c: Misses by  $0.534$  mi in  $0.178$  hr

### Group 3 Problems:

Problem 12a:  $\Delta x = 21.8$  m

Problem 12b:  $\Delta x = 29.8$  m

Problem 13a:  $\Delta x_R = 4h$

Problem 13b:  $x_{0,T} = 4h - v_T \sqrt{\frac{8h}{g}}$

Problem 13c:  $\vec{v}_{rel} = (\sqrt{2gh} - v_T)\hat{i}$  and  $\vec{a}_{rel} = -g\hat{j}$

Problem 14:  $x = 33.7$  m

### Problem 15:

For:  $\Delta x = -2$ ,  $\theta = 74.5$  degrees upstream

For:  $\Delta x = 0$ ,  $\theta = 14.5$  degrees upstream

For:  $\Delta x = +2$ ,  $\theta = 64.4$  degrees downstream