# Phys 218 – Fall 2016
## All Sections

### Physics 218 – Exam I

**Short Answer:**  1) $\theta = 11.3°$  [LO 2.1, 3.1]

2) At the maximum height, $H$  [LO 11.1, 12.1, 13.1]
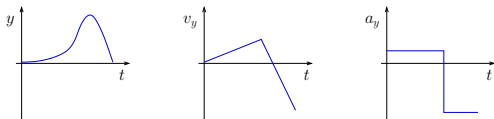
3)   [LO 12.2, 13.2]

4) $R = 1.66 \times 10^{-3}$ m$^3$/s  [LO 10.1]

5) $|\vec{a}| = 1.68 \times 10^3$ m/s$^2$  [LO 18.1, 19.1, 20.1]

**Problem 1:**  (a) $h = 602$ m  [LO 3.2, 12.3, 14.1]

(b) $t_{\text{tot}} = 38.1$ s  [5.1, 14.2]

(c)   [LO 12.4, 13.3, 13.4]

**Problem 2:**  (a) $d = 28$ m  [LO1.1, 3.3, 5.2, 14.3, 15.1]

(b) $\alpha = 8.6°$ below the horizontal  [LO 13.5]

(c) $\langle \vec{v} \rangle = (64.7\hat{i} - 7.75\hat{j})$ m/s or 65.2 m/s at 6.8° below the horizontal  [LO11.2]

**Problem 3:**  (a) $\vec{v}_{\text{ball/cyclist}} = (0.5\hat{i} + 1.0\hat{j})$ m/s or 1.12 m/s at 26.6° clockwise from $\hat{j}$  [LO 1.2, 2.2, 21.1]

(b) $\vec{d}_{\text{train}} = 5.0\hat{j}$ m and $\vec{d}_{\text{cyclist}} = (2.5\hat{i} + 5.0\hat{j})$ m = 5.59 m/s at 26.6° clockwise from $\hat{j}$  [LO 12.5]

(c) $\theta = 30°$ counterclockwise from $\hat{j}$  [LO 7.1, 21.2]

(for these answers, we take $\hat{i}$ to be along $\vec{v}_{\text{rail}}$ and $\hat{j}$ to be along $\vec{v}_y$ as shown on the exam)

**Problem 4:**  (a) $v(t) = a_0 t + \frac{2}{3}bt^{3/2}$  [LO 8.1, 14.4, 15.2]

(b) $d = \frac{1}{2}a_0 t^2 + \frac{4}{15}bt^{5/2}$  [LO 8.2, 14.5]

(c) $\theta = \tan^{-1}\left[\dfrac{\left(a_0 t + \frac{2}{3}bt^{3/2}\right)^2}{R(a_0 + bt^{1/2})}\right]$  [LO 1.3, 18.2]