

### CLASS PROBLEMS (CHAPTER 3)

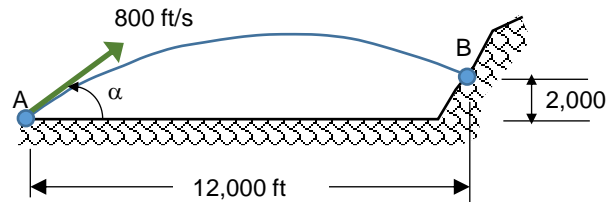
#### Problem 1)

The coordinates of a bird flying in the  $xy$ -plane are given by  $x(t) = at$  and  $y(t) = 3.0\text{m} - bt^2$ , where  $a = 2.4\text{ m/s}$  and  $b = 1.2\text{ m/s}^2$ .

- Sketch the path of the bird between  $t = 0$  and  $t = 2.0\text{ s}$ .
- calculate the velocity and acceleration vectors of the bird as a function of time.
- Calculate the magnitude and direction of the bird's velocity and acceleration at  $t = 2.0\text{ s}$ .
- Sketch the velocity and acceleration vectors at  $t = 2.0\text{ s}$ . At this instant, is the bird speeding up, is it slowing down, or is its speed instantaneously not changing? Is the bird turning? If so, in what direction?

#### (Problem 2)

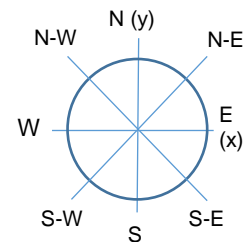
A projectile is fired with an initial velocity of  $800\text{ ft/s}$  at a target B located  $2,000\text{ ft}$  above the gun A and a horizontal distance of  $12,000\text{ ft}$ . Neglecting air resistance, determine the value of the firing angle  $\alpha$ .



#### Problem 3)

The nose of an ultralight plane is pointed south, and its airspeed (speed relative to air) indicator shows  $36\text{ km/h}$ . The plane is in wind blowing toward S-W. The plane speed relative to ground is  $75\text{ km/h}$ .

- In a vector-addition diagram, show the relationship of the velocities.
- find the direction of the plane relative to ground.
- find the wind velocity relative to ground in  $\text{km/h}$ .



all angles =  $45^\circ$

#### Problem 4)

A basketball player shoots when she is  $16.0\text{ feet}$  from the backboard. Knowing that the ball has an initial velocity  $v_0$  at an angle of  $30^\circ$  with the horizontal, determine the value of  $v_0$  when  $d = 9.0\text{ inches}$ . **DO NOT** convert the units to SI units.

