

Circle your recitation section:
icas

1. 8:00 TBA (rotating) 2. 9:05 Bal-

3. 10:10 Frawley 4. 11:15 Frawley

Other (write in):

SHOW ALL WORK TO GET FULL CREDIT! – ALL ANSWERS MUST SHOW UNITS

In the following air resistance is neglected and gravity ($g = 9.81 \text{ m/s}^2$) acts in the negative y -direction. At time $t = 0$ a ball is kicked to have the initial conditions

$$x_0 = 0, v_{x,0} = 22 \text{ m/s} \quad \text{and} \quad y_0 = 0, v_{y,0} = 11 \text{ m/s} .$$

1. [6 Pts] Write down the solutions for $x(t)$ and $y(t)$.

$$x(t) = v_{x,0} t$$

$$y(t) = v_{y,0} t - \frac{1}{2} g t^2$$

2. [4Pts] Find the time t_{max} at which the ball reaches its maximum height.

$$t_{\text{max}} = \frac{v_{y,0}}{g} = 1.12 \text{ s}$$

3. [2 Pts] Find the maximum height.

$$y_{\text{max}} = y(t_{\text{max}}) = v_{y,0} t_{\text{max}} - \frac{1}{2} g t_{\text{max}}^2 = 6.17 \text{ m}$$

4. [4Pts] How long is the ball in the air, before it returns to hit the ground?

$$t_1 = 2 t_{\text{max}} = 2.24 \text{ s}$$

5. [2 Pts] At what distance from its original position does the ball hit the ground.

$$x_1 = v_{x,0} t_1 = 49.3 \text{ m}$$

6. [2 Pts] Calculate the angle θ at which the ball was kicked in the air.

$$\theta = \arctan \left(\frac{v_{y,0}}{v_{x,0}} \right) = 26.6^\circ$$