

# Parametric Coordinates and Equations .... Set 4

## Word Problem Practice - Parametric Equations

1. **PHYSICS** A rock is thrown at an initial velocity of 5 meters per second at an angle of  $8^\circ$  with the ground. After 0.4 second, how far has the rock traveled horizontally?

$$x = (5 \cos 8^\circ)t$$

$$x(0.4) = (5 \cos 8^\circ)(0.4) \approx 1.981 \text{ meters}$$

2. **PLAYING CATCH** Tom and Sarah are playing catch. Tom tosses a ball to Sarah at an initial velocity of 38 feet per second at an angle of  $28^\circ$  from a height of 4 feet. Sarah is 40 feet away from Tom.

- a. How high above the ground will the ball be when it gets to Sarah?

$$x = (38 \cos 28^\circ)t = 40$$

$$t = 1.192$$

$$y = -16t^2 + (38 \sin 28^\circ)t + 4$$

$$y(1.192) = -16(1.192)^2 + (38 \sin 28^\circ)(1.192) + 4 \\ = 2.531 \text{ feet}$$

- b. What is the maximum height of the ball?

Find the vertex of the parabola:  $y = 8.973 \text{ feet}$

3. **TENNIS** Melinda hits a tennis ball with an initial velocity of 42 feet per second at an angle of  $16^\circ$  with the horizontal from a height of 2 feet. She is 20 feet from the net and the net is 3 feet high. Will the ball go over the net?

$$x = (42 \cos 16^\circ)t = 20$$

$$t = .495$$

$$y = -16t^2 + (42 \sin 16^\circ)t + 2$$

$$y(0.495) = 3.810 \text{ feet}$$

$$3.810 > 3$$

yes

4. **BASKETBALL** Mandy throws a basketball with an initial velocity of 28 feet per second at an angle of  $60^\circ$  with the horizontal. If Mandy releases the ball from a height of 5 feet, write a pair of equations to determine the vertical and horizontal positions of the ball.

$$x = (28 \cos 60^\circ)t$$

$$y = -16t^2 + (28 \sin 60^\circ)t + 5$$

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5. **GOLF** Julio hit a golf ball with an initial velocity of 100 feet per second at an angle of  $39^\circ$  with the horizontal.

a. Write parametric equations for the flight of the ball.

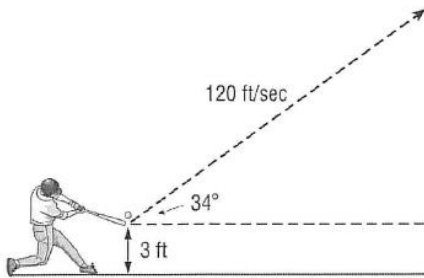
$$x = (100 \cos 39) t$$

$$y = -16 t^2 + (100 \sin 39) t$$

b. Find the maximum height the ball reaches.

Find vertex of parabola:  $y = 61.882$  feet at  $t = 1.967$  seconds

6. **BASEBALL** Micah hit a baseball at an initial velocity of 120 feet per second from a height of 3 feet at an angle of  $34^\circ$ .



a. How far will the ball travel horizontally before it hits the ground?

$$y = -16 t^2 + (120 \sin 34) t + 3 = 0$$

$$t = \cancel{4.238} \quad 4.238$$

$$x = (120 \cos 34) t$$

$$x(4.238) = (120 \cos 34)(4.238)$$

$$\approx 421.615 \text{ feet}$$

b. What is the maximum height the ball will reach?

Find vertex of the parabola:  $y = 73.357$  feet

c. If the fence is 8 feet tall and 400 feet from home plate, will the ball clear the fence to be a home run? Explain.

$$x = 120 \cos(34) t = 400$$

$$t = 4.021$$

$$y(4.021) = 14.128 \text{ feet}$$

$$14.128 > 8$$

Yes, the ball will clear the fence.