Precalculus Unit 6
Addison Wesley Resource p.9 – 10 , 11 – 12 (H) Name _____

Parametric Modeling Problems

Use the parametric equations $x = (v_o \cos\theta)t$, $y = -16t^2 + (v_o \sin\theta)t + y_o$ to solve the following problems.

1. The left-field fence at a baseball park is 400 feet from home plate and 8 feet high. A baseball is hit from 2 feet high with an initial velocity of 150 feet per second at an angle of 25 degrees with the horizontal.

   a. Write a set of parametric equations that model the path of the baseball.

   $X = 150\cos(25)t$

   $y = 150\sin(25)t - 16t^2 + 2$

   b. Is the hit a home run? Justify your answer.

   yes. when the ball is 407.84 ft away, it is still 48.178 ft high.

2. An arrow is shot from a bow 4 feet above the ground at an angle of 10 degrees with the horizontal with an initial velocity of 250 feet per second.

   a. Write a set of parametric equations that model the path of the arrow.

   $X = 250\cos(10)t$

   $y = -16t^2 + 250\sin(10)t + 4$

   b. Find the amount of time that the arrow is in the air.

   2.802 seconds

   c. Find the horizontal distance that the arrow travels before it hits the ground.

   689.86 ft

   d. What is the maximum height of the arrow?

   33.447 ft

3. A golfer hits a ball with an initial velocity of 150 feet per second at an angle of 31 degrees with the horizontal.

   a. Write a set of parametric equations that model the path of the golf ball.

   $X = 150\cos(31)t$

   $y = -16t^2 + 150\sin(31)t$

   b. If the ball travels between 200 and 220 yards, it will land on the green. Does the ball land on the green? Justify your answer.

   No, The ball hits the ground between 4 and 5 seconds and the horizontal distance between those times is 514.3 and 642.8

4. Another golfer needs to hit over a tree that is 30 feet high and 100 yards away. He hits the ball with an initial velocity of 120 feet per second at an angle of 28 degrees with the horizontal. Does the ball go over the tree? Justify your answer.

   $X = 120\cos(28)t$

   $y = -16t^2 + 120\sin(28)t$

   Yes the ball goes over the tree b/c when $t = .95$, $x = 100.66$, $y = 39.08$

5. Jack throws a ball off of the roof of a building 300 feet high with an initial speed of 100 feet per second at an angle of 45 degrees with the horizontal.

   a. Write a set of parametric equations that model the path of the ball.

   $X = 100\cos(45)t$

   $y = -16t^2 + 100\sin(45)t + 300$

   b. How long is the ball in the air?

   7.071 seconds

   c. Determine the horizontal distance that the ball has traveled when it hits the ground.

   500 ft

   d. Determine the maximum height of the ball.

   378.11 ft