In Exercises 91–100, find all points (if any) of horizontal and vertical tangency to the curve. Use a graphing utility to confirm your results.

91. $x = 1 - t, \quad y = t^2$

92. $x = t + 1, \quad y = t^2 + 3t$

93. $x = 1 - t, \quad y = t^3 - 3t$

94. $x = t^2 - t + 2, \quad y = t^3 - 3t$

101. ***Archery*** An archer releases an arrow from a bow 5 feet above the ground. The arrow leaves the bow at an angle of 10° with the horizontal and at an initial speed of 240 feet per second.

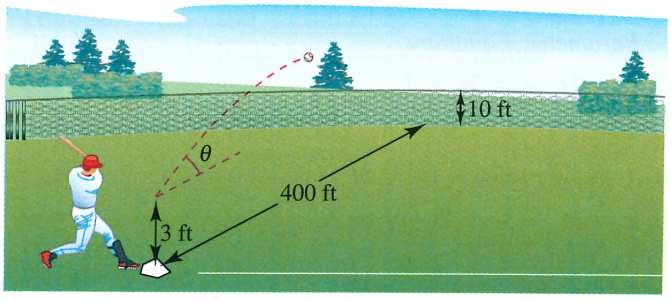
(a) Write a set of parametric equations for the path of the arrow.

(b) Assuming the ground is level, find the distance the arrow travels before it hits the ground. (Ignore air resistance.)

(c) Graph the path of the arrow and approximate its maximum height. Verify your result analytically.

(d) Find the time the arrow is in the air.

102. ***Baseball*** The center field fence in a ballpark is 10 feet high and 400 feet from home plate. The baseball is hit 3 feet above the ground. It leaves the bat at an angle of θ degrees with the horizontal at a speed of 100 miles per hour (see figure).



(a) Write a set of parametric equations for the path of the baseball.

(b) Use a graphing utility to sketch the path of the baseball if $\theta = 15°$. Is the hit a home run?

(c) Use a graphing utility to sketch the path of the baseball if $\theta = 23°$. Is the hit a home run?

(d) Find the minimum angle required for the hit to be a home run.

103. ***Projectile Motion*** The position function for the path of a projectile is modeled by the parametric equations

$$x = (v_0 \cos \theta)t$$

and

$$y = h + (v_0 \sin \theta)t - 16t^2,$$

104. ***Path of a Projectile*** The path of a projectile is given by the rectangular equation

$$y = 7 + x - 0.02x^2.$$

(a) Use the result of Exercise 103 to find h, v_0, and θ. Find the parametric equations of the path.

(b) Use a graphing utility to graph the rectangular equation for the path of the projectile. Confirm your answer in part (a) by sketching the curve represented by the parametric equations.

(c) Use a graphing utility to approximate the maximum height of the projectile and its range.

True or False? **In Exercises 105–108, determine whether the statement is true or false. If it is false, explain why or give an example that shows it is false.**

105. The sets of parametric equations

$$x = t$$

$$y = t^2 + 1$$

and

$$x = 3t$$

$$y = 9t^2 + 1$$

have the same rectangular equation.

106. The graph of the parametric equations $x = t^2$ and $y = t^2$ is the line $y = x$.

107. Only one set of parametric equations can represent the line $y = 3 - 2x$.

108. The graph of the set of parametric equations

$$x = 2 \tan t$$

$$y = \sec t$$

is a hyperbola.