Name: _____

3.2.D3 • Modeling with Quadratic Functions

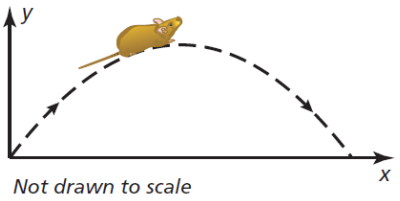
Past due on: _____ Period: _____

1. The path of a basketball thrown at an angle of 45° can be modeled by $d(x) = -0.02x^2 + x + 6$, where x is the horizontal distance (in feet) and $d(x)$ is the vertical distance (in feet). Find and interpret the coordinates of the vertex.

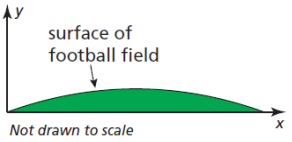
2. The path of a diver is modeled by the function $h(x) = -9x^2 + 9x + 1$, where $h(x)$ is the height of the diver (in meters) above the water and x is the horizontal distance (in meters) from the end of the diving board.
   a. Identify and interpret the practical meaning of the vertical intercept.
   b. What is the maximum height of the diver?

3. A store sells about 40 video game systems each month when it charges \$200 per system. For each \$10 increase in price, about 1 less system per month is sold. The store's revenue can be modeled by $R(x) = (200 + 10x)(40 - x)$, where x represents the number of price increases. How can the store *maximize* monthly revenue?

4. A woodland jumping mouse hops along a parabolic path given by $h(x) = -0.2x^2 + 1.3x$, where x is the mouse's horizontal distance traveled (in feet) and $h(x)$ is the corresponding height (in feet). Can the mouse jump over a fence that is 3 feet high? Explain your reasoning.



5. Although a football field appears to be flat, some are actually shaped like a parabola so that rain runs off to both sides. The cross section of a field can be modeled by $y = -0.000234x(x - 160)$, where x and y are measured in feet.
   a. What is the width of the field?
   b. What is the maximum height of the surface of the field?



6. You have 80 yards of fencing to enclose a rectangular region. Find the dimensions of the region that *maximizes* the enclosed area.
   a. Write a function that represents the situation.
   b. What are the dimensions of the region?
   c. What is the largest area that can be enclosed?

7. You have 600 feet of fencing to enclose a rectangular plot that borders on a river. If you do not fence the side along the river, find the length and width of the plot that will *maximize* the area.
   a. Write a function that represents the situation.
   b. What are the dimensions of the plot?
   c. What is the largest area that can be enclosed?

8. A rectangular playground is to be fenced off and divided in two by another fence parallel to one side of the playground. Four hundred feet of fencing is used. Find the dimensions of the playground that *maximize* the total enclosed area.
    a. Write a function that represents the situation.
    b. What are the dimensions of the playground?
    c. What is the largest area that can be enclosed?

9. A surfboard shop sells 45 surfboards per month when it charges $500 per surfboard. For each $20 decrease, the store sells 5 more surfboards per month.
    a. Write a function that gives the shop's revenue $R(x)$ if there are x price deductions.
    b. How much should the shop charge per surfboard in order to *maximize* monthly revenue?
    c. How many surfboards would the shop sell?
    d. What would the maximum monthly revenue be?

10. An online music store sells about 4000 songs each day when it charges $1 per song. For each $0.05 increase in price, about 80 fewer songs per day are sold. How can the store maximize daily revenue?
    a. Write a function that gives the store's revenue $R(x)$ if there are x price increases.
    b. How much should the music store charge per song in order to *maximize* daily revenue?
    c. How many songs would the store sell?
    d. What would the maximum daily revenue be?