

REVIEW

Applications of quadratic functions

Math 120R

- A 5.6 feet tall woman is shooting a free throw. The path of the basketball is parabolic in shape and the ball reaches its maximum height of 11.5 feet when the ball is 10 feet from the player.
 - Find the equation for the path of the ball. Let x be the horizontal distance from the shooter, and y be the height of the ball.
 - the ball hits the front of the rim, which is 10 feet high. How far is the shooter from the rim?
- A homeowner wants to fence in a rectangular garden next to a very long stream. Since the garden will border the stream, that side of the garden will not need fencing. What is the largest area that can be enclosed with 220 feet of fencing? What are the dimensions of the garden?
- A box is being constructed by cutting 2-inch squares from the corners of a rectangular piece of cardboard that is 6 inches longer than it is wide. If the box is to have volume of 224 cubic inches, find the dimensions of the cardboard.
- Prove the quadratic formula $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$. (Hint: Start with $ax^2 + bx + c = 0$ and complete the square.)
- A cylindrical aluminum can be constructed to have surface area equal to $100\pi r$ where r is the radius, and volume equal to $225\pi h$ where h is the height of the cylinder. Find r , h and the volume.
- Room prices are regularly \$100, but for each additional room rented by a group, the price is reduced by \$3 for each room. For example, 1 room costs \$100, 2 rooms cost $2 \times \$97 = \194 , 3 rooms cost $3 \times \$94 = \282 , and so on.
 - Write a quadratic function C that gives the total cost of renting x rooms.
 - What is the total cost of renting 6 rooms?
 - How many rooms are rented if the total cost is \$730?
 - What number of rooms rented results in the greatest total cost?
- When slam-dunking, a basketball player seems to hang in the air at the height of his jump. The height $h(t)$, in feet above the ground, of the basketball player at time t , in seconds since the start of a jump, is given by

$$h(t) = -16t^2 + 16Tt,$$

where T is the total time in seconds that it takes to complete the jump. For a jump that takes 1 second to complete, how much of this time does the basketball player spend at the top 25% of the trajectory? [Hint: Find the maximum height reached. Then find the times at which the height is 75% of this maximum.]

- A frame for a picture is 2 inches wide. The picture inside the frame is 4 inches longer than it is wide. If the area of the picture is 320 square inches find the outside dimensions of the picture frame.