Sketch a rough graph of the situations (if one is not given). Then use the information to answer the questions.

1. The amount of cloth used to make four curtains is given by the function $A = -4x^2 + 40x$, where x is the width of one curtain in feet and A is the total area in square feet. Find the width that maximizes the area of the curtains. What is the maximum area?

2. A manufacturer of fax machines find that the cost (in dollars) generated by manufacturing x units per week is given by the function $C(x) = 0.15x^2 - 39x + 4500$. How many units should be manufactured to minimize the cost? What is the minimum Cost? What is the y-intercept and what does it represent?

3. A small independent motion picture company determines the profit P for producing n DVD copies of a recent release is $P = -0.02n^2 + 3.40n - 16$. P is the profit in thousands of dollars and n is in thousands of units.
   a. How many DVDs should the company produce to maximize the profit?
   b. What will the maximize profit be?

4. A local nursery sells a large number of ornamental trees every year. The owners have determined the cost per tree C for buying and caring for each tree before it is sold is $C = 0.001n^2 - 0.3n + 50$. In this function, C is the cost per tree in dollars and n is the number of trees in stock.
  a. How many trees will minimize the cost per tree?
  b. What will the minimum cost per tree be?

5. On a suspension bridge, the roadway is hung from cables hanging between support towers. The cable of one bridge is in the shape of the parabola $y = 0.1x^2 - 7x + 150$, where y is the height in feet of the cable above the roadway at the distance x feet from a support tower.
  a. What is the closest the cable comes to the roadway?
  b. How far from the support tower does this occur?

6. The number of board feet in a 16 foot long tree is approximated by the model $F(d) = 0.77d^2 - 1.32d - 9.31$ where F is the number of feet and d is the diameter of the log. How many board feet are in a log with diameter 12 inches? What is the diameter that will produce the minimum number of board feet?

7. The value of Jennifer's stock portfolio is given by the function $v(t) = 50 + 73t - 3t^2$, where v is the value of the portfolio in hundreds of dollars and t is the time in months. How much money did Jennifer start with? When will the value of Jennifer's portfolio be at a maximum?

8. A manufacturer of tennis balls has a daily cost of $C(x) = 200 - 10x + 0.01x^2$ where C is the total cost in dollars and x is the number of tennis balls produced. What number of tennis balls will produce the minimum?

9. Find the number of units that produce the maximum revenue $R = 900x - 0.1x^2$, where R is the total revenue (in dollars) and x is the number of units sold.

10. The value of Jon's stock portfolio is given by the function $v(t) = 50 + 77t - 8t^2$ where v is the value of the portfolio in hundreds of dollars and t is the time in months. How much money did Jon start with? What is the minimum value of Jon's portfolio?

11. A textile manufacturer has daily production costs of $C = 10{,}000 - 110x + 0.045x^2$, where C is the total cost (in dollars) and x is the number of units produced. How many units should be produced each day to yield a minimum cost?

12. A company earns a weekly profit of P dollars by selling x items, according to the equation $P(x) = -0.5x^2 + 40x - 300$. How many items does the company have to sell each week to maximize the profit?

13. The profit function telling Georgio how much money he will net for producing and selling x specialty umbrellas is given by $P(x) = -0.00405x^2 + 8.15x - 100$.

What is Georgio's loss if he doesn't sell any of the umbrellas he produces and how many does he have to sell to earn the greatest possible profit?

14. Chip ran through a maze in less than a minute the first time he tried. His times got better for a while with each new try, but then his times got worse (he took longer) due to fatigue.

The amount of time Chip took to run through the maze on the ath try can be modeled by $T(a) = 0.5a^2 - 9a + 48.5$. How long did Chip take to run the maze the second time, and what was his best time?

15. A highway underpass is parabolic in shape. If the curve of the underpass can be modeled by $h(x) = 50 - 0.02x^2$, where x and $h(x)$ are in feet, then how high is the highest point of the underpass?