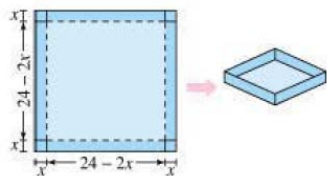


3.7 Optimization Problems

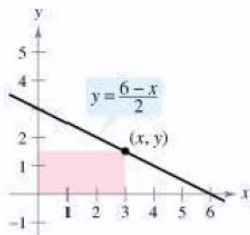
- 1.) Find two positive numbers whose product is 192 and the sum is a minimum.
- 2.) Find two positive numbers whose sum of the first and twice the second is 100 and the product is a maximum.
- 3.) Find the length and width of a rectangle that has an area of 64 square feet and a minimum perimeter.
- 4.) Find the point on the graph or the function that is closest to the given point.
Function: $f(x) = \sqrt{x-8}$ Point: (12,0)
- 5.) In an autocatalytic chemical reaction, the product formed is a catalyst for the reaction. If Q_0 is the amount of the original substance and x is the amount of catalyst formed, the rate of chemical reaction is $\frac{dQ}{dx} = kx(Q_0 - x)$. For what value of x will the rate of chemical reaction be greatest?
- 6.) A rancher has 200 feet of fencing with which to enclose two adjacent rectangular corrals. What dimensions should be used so that the enclosed area will be a maximum?



- 7.) An open box of maximum volume is to be made from a square piece of material, 24 inches on a side, by cutting equal squares from the corners and turning up the sides.
 - a. Find the maximum volume of the box.
 - b. If the dimensions are doubled, how does the volume change?



- 8.) A rectangle is bounded by the x - and y -axes and the graph of $y = (6-x)/2$ (see figure). What length and width should the rectangle have so that its area is a maximum?



- 9.) The sum of the perimeters of an equilateral triangle and a square is 10. Find the dimensions of the triangle and the square that produce a minimum total area.
- 10.) An offshore oil well is 2 kilometers off the coast. The refinery is 4 kilometers down the coast. If laying pipe in the ocean is twice as expensive as on land, what path should the pipe follow in order to minimize the cost?