More Optimization

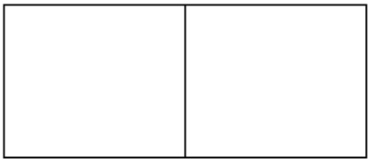
1) The sum of a positive number and 4 times the square of its reciprocal is a minimum. What is the number?

2) A landscape architect wishes to enclose a rectangular garden on one side by a brick wall costing \$30 per foot and on the other three sides by a metal fence costing \$10 per foot. If the area of the garden is 1,000 square feet, find the dimensions of the garden that minimize the cost.

3) Find the point on the curve $y = \sqrt{x}$ that is closest to (2,0).

4) Find the area of the largest rectangle that can be inscribed in the region bounded by the graph of $y = \dfrac{4-x}{x+2}$ and the coordinate axes (first quadrant).

5) Suppose you had 12 meters of fencing to make two side-by-side enclosures as shown. What is the maximum area that you could enclose?



6) A manufacturer wants to design an open box having a square base and a surface area of 108 square inches. What dimensions will produce a box with maximum volume?

7) An open rectangular box has a square base and a volume of 500 cubic inches. What dimensions minimize the amount of cardboard needed to make the box?

8) Find the area of the largest rectangle that is bounded on the top by $x^2 + y^2 = 16$ and on the bottom by the x-axis.

Answers

1) 2
2) length of brick wall $10\sqrt{5}$ ft ; adjacent side : $20\sqrt{5}$ ft
3) $\left(\dfrac{3}{2}, \sqrt{\dfrac{3}{2}}\right)$
4) Area = $8 - 4\sqrt{3}$ square units
5) 6 square meters
6) 6 in by 6 in by 3 in
7) 10 in x 10 in x 5 in
8) 16 square units