Sections 4.4-4.5: Absolute Maxima & Minima

Find the absolute maximum and minimum values of *f*, if any, on the given interval, and state where those values occur.

7. $f(x) = 4x^2 - 12x + 10; [1,2]$
11. $f(x) = \frac{3x}{\sqrt{4x^2+1}}; [-1,1]$
15. $f(x) = 1 + |9 - x^2|; [-5,1]$
21. $f(x) = x^2 - x - 2; (-\infty, \infty)$
25. $f(x) = 2x^3 - 6x + 2; (-\infty, \infty)$
27. $f(x) = \frac{x-2}{x+1}; (-5, -1)$
37. $f(x) = x^3 e^{-2x}; [1,4]$

5. A rectangular plot of land is to be fenced in using two kinds of fencing. Two opposite sides will use heavy-duty fencing selling for $3 a foot, while the remaining two sides will use standard fencing selling for $2 a foot. What are the dimensions of the rectangular plot of greatest area that can be fenced in at a cost of $6000?

11. A rectangular area of 3200 square feet is to be fenced off. Two opposite sides will use fencing costing $1 per foot and the remaining sides will use fencing costing $2 per foot. Find the dimensions of the rectangle of least cost.

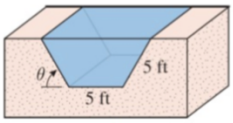
21. An open box is to be made from a 3 ft by 8 ft rectangular piece of sheet metal by cutting out squares of equal size from the four corners bending up the sides. Find the maximum volume that the box can have.

43. a. A chemical manufacturer sells sulfuric acid in bulk at a price of $100 per unit. If the daily total production cost (in dollars) for *x* units is $C(x) = 100000 + 50x + .0025x^2$ and if the daily production capacity is at most 7000 units, how many units of sulfuric acid must be manufactured and sold daily to maximize profit?

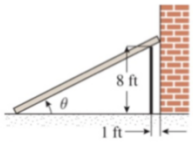
b. Would it benefit the manufacturer to expand the daily production capacity?

c. Use marginal analysis to approximate the effect on profit if daily production could be increased from 7000 to 7001 units. *See page 283.*

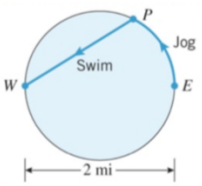
48. A drainage channel is to be made so that its cross section is a trapezoid with equally sloping sides (see figure). If the sides of the bottom all have a length of 5 ft, how should the angle θ ($0<\theta<\pi/2$) be chosen to yield the greatest cross-sectional area of the channel?



50. A plank is used to reach over a fence of 8 ft high to support a wall that is 1 ft behind the fence (see figure). What is the length of the shortest plank that can be used? (Hint: Express the length of the plank in terms of the angle θ shown in the figure.)



57. The shoreline of Circle Lake is a circle with diameter 2 mi. Nancy's training routine begins at a point E on the eastern shore of the lake. She jogs along the north shore to a point P and then swims the straight line distance, if any, from P to point W diametrically opposite E (see figure). Nancy swims at a rate of 2 mi/hr and jogs at 8 mi/hr. How far should Nancy jog in order to complete her training routine in



a. the least amount of time

b. the greatest amount of time?