Math 20A, Homework 4, Part 1

Exercise 1 Find the maximum and minimum of $y = x + 4/x$ for $1 \le x \le 3$.

Answer: [Maximum] = $y(1) = 5$ • [Minimum] = $y(2) = 4$

Exercise 2 What are the maximum and minimum values of $y = x^2 e^x$ for $-5 \le x \le 1$?

Answer: [Maximum] = $y(1) = e$ • [Minimum] = $y(0) = 0$

Exercise 3 What are the maximum and minimum values of $y = (\ln x)^2$ on $[\frac{1}{10}, 10]$?

Answer: [Maximum] = $[\ln(10)]^2$ at $x = \frac{1}{10}$ and at $x = 10$ • [Minimum] = 0 at $x = 1$

Exercise 4 If you will sell $x(p) = p/(p^3 + 4)$ units of a product if you charge p dollars per unit, what price would maximize your revenue?

Answer: The revenue is a maximized if the price is \$2 per item.

Exercise 5 Use calculus to find the point Q on the line $y = 4x + 3$ that is closest to the point $P(2, -6)$.

Answer: • $x = -2$, $y = -5$

Exercise 6 A farmer has 40 tons of cattle that he could sell for a profit of 200 dollars per ton. For every week he waits to sell the cattle, their total weight will increase by one ton, but his profit will fall by four dollars per ton. **(a)** What will be his profit if he sells in two weeks? **(b)** When should he sell to maximize his profit?

Answer: **(a)** [Profit after 2 weeks] =8064 dollars **(b)** He should sell in 5 weeks.

Exercise 7 Find the rectangle with perimeter 20 feet that has the maximum area.

Answer: A five-foot wide square

Exercise 8 A box without a top is to be made from a piece of cardboard six inches square by cutting equal squares of width x (inches) from the corners and folding up the sides (Figure 1). What size squares should be cut out to maximize the volume of the box? (Hint: $12x^2 - 48x + 36 = 12(x - 1)(x - 3)$)

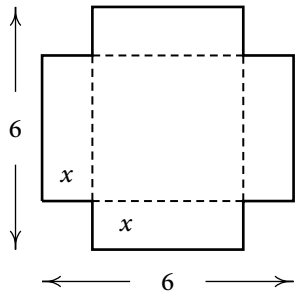

FIGURE 1

Answer: One-inch wide squares