Calculus for Business MAC2233

Review for Test–3 Name_______________________________

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Find the x–value of all points where the function has relative extrema. Find the value(s) of any relative extrema.

1) $f(x) = 3x^4 + 16x^3 + 24x^2 + 32$

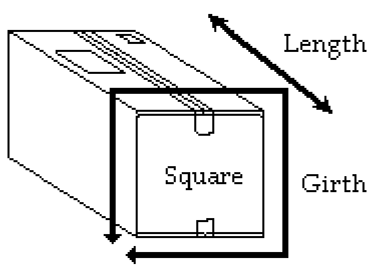
Find the indicated absolute extremum as well as all values of x where it occurs on the specified domain.

2) $f(x) = 3x^4 + 16x^3 + 24x^2 + 32$; $[-3, 1]$
Maximum

Solve the problem.

3) An architect needs to design a rectangular room with an area of 93 ft^2. What dimensions should he use in order to minimize the perimeter?

4) A private shipping company will accept a box for domestic shipment only if the sum of its length and girth (distance around) does not exceed 90 in. What dimensions will give a box with a square end the largest possible volume?



Provide an appropriate response.

5) Find the critical values and determine the intervals where f(x) is decreasing for $f(x) = 3(x - 4)^{2/3} + 6$.

6) The average manufacturing cost per unit (in hundreds of dollars) for producing x units of a product is given by:
$\overline{C}(x) = 2x^3 - 42x^2 + 288x + 12, \quad 1 \le x \le 5$
At what production level will the average cost per unit be maximum?

7) A 60 room hotel is filled to capacity every night at a rate of $40 per room. The management wants to determine if a rate increase would increase their profit. They are not interested in a rate decrease. Suppose management determines that for each $2 increase in the nightly rate, five fewer rooms will be rented. If each rented room costs $8 a day to service, how much should the management charge per room to maximize profit?

Solve the problem.

8) Determine the absolute extrema of the function $f(x) = \dfrac{1}{2x^2 + 2}$ on the interval $[-1, 1]$.

9) The price–demand function for a product can be approximated by

$p(x) = 2700 - x^2, \qquad 0 \le x \le 50$

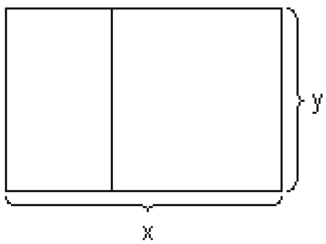
where x represents the quantity demanded and p(x) represents the price in dollars.

i) Determine R(x), revenue as a function of the quantity x demanded.

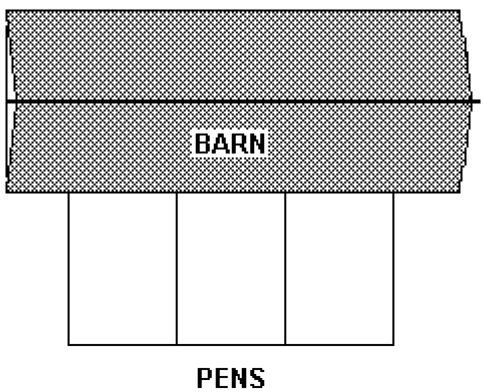
ii) Determine intervals where R is increasing and where R is decreasing.

iii) Determine the relative maximum and interpret each coordinate.

10) Jason has 480 feet of fencing with which to enclose two adjacent lots as shown in the figure below. Determine the dimensions x and y that maximize the total area. What is the maximum area?



11) A farmer decides to make three identical pens with 144 feet of fence. The pens will be next to each other sharing a fence and will be up against a barn. The barn side needs no fence.



What dimensions for the total enclosure (rectangle including all pens) will make the area as large as possible?

12) If the price charged for a bolt is p cents, then x thousand bolts will be sold in a certain hardware store, where $p = 48 - \frac{x}{16}$. How many bolts must be sold to maximize revenue?

13) A baseball team is trying to determine what price to charge for tickets. At a price of $10 per ticket, it averages 35,000 people per game. For every increase of $1, it loses 5,000 people. Every person at the game spends an average of $5 on concessions. What price per ticket should be charged in order to maximize revenue?

For the following function:
A)Find the intervals where the function is concave upward/downwads.
B) Find the inflection points.

14) $f(x) = x^3 - 3x^2 - 4x + 5$

1) Relative minimum of 32 at 0.
2) 75 at $x = 1$
3) 9.64 ft × 9.64 ft
4) 15 in. × 15 in. × 30 in.
5) $f(x)$ is decreasing on $(-\infty, 4)$; increasing on $(4, \infty)$
6) 5 units
7) The management should leave the rate as it is.
8) f has an absolute maximum of $\frac{1}{2}$ at $x = 0$

   f has an absolute minimum of $\frac{1}{3}$ at $x = -1$ and at $x = 1$

9) i) $R(x) = 2700x - x^3$
   ii) R is increasing on (0, 30)
   R is decreasing on (30, 50)
   iii) relative maximum at (30, 54,000)
   There is a maximum revenue of $54,000 when 30 units of the product are produced and sold.
10) $x = 120$ feet, $y = 80$ feet; 9600 square feet
11) 18 ft by 72 ft
12) 384 thousand bolts
13) $6.00
14) $(1, \infty)$