Math 122 Pretest 3

This test is designed to give an example of what types of questions may be on the test. Show all work for full credit.

1. Find the global maximum and global minimum of $f(x)$ over the given interval.

$$f(x) = 2x^3 - 3x^2 - 12x + 1 \text{ over } [-2, 3]$$

2. Find the global maximum and global minimum of $f(x)$ over the given interval.

$$f(x) = x^3 - 9x^2 + 15x + 1 \text{ over } [0, 8]$$

3. Find the quantity that maximizes profit if the total cost and total revenue (in dollars) are given by

$$\begin{aligned} C(x) &= 2000 + 196x + 3x^2 \\ R(x) &= 500x - x^2 \end{aligned}$$

where x is the quantity. Prove that you have a maximum. What is the maximum profit?

SOLUTIONS

MATH 122 PRETEST 3

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1. Find the global maximum and global minimum of $f(x)$ over the given interval.

$$f(x) = 2x^3 - 3x^2 - 12x + 1 \text{ over } [-2, 3]$$

$f'(x) = 6x^2 - 6x - 12$
$= 6(x^2 - x - 2)$
$= 6(x-2)(x+1)$

Critical Points: 2, −1

Compare:
$f(-2) = -3$
$f(-1) = 8$ global max
$f(2) = -19$ global min
$f(3) = -8$

2. Find the global maximum and global minimum of $f(x)$ over the given interval.

$$f(x) = x^3 - 9x^2 + 15x + 1 \text{ over } [0, 8]$$

$f'(x) = 3x^2 - 18x + 15$
$= 3(x^2 - 6x + 5)$
$= 3(x-5)(x-1)$

Critical Points: 5, 1

Compare:
$f(0) = 1$
$f(1) = 8$
$f(5) = -24$ global min
$f(8) = 57$ global max

3. Find the quantity that maximizes profit if the total cost and total revenue (in dollars) are given by

$$\begin{aligned} C(x) &= 2000 + 196x + 3x^2 \\ R(x) &= 500x - x^2 \end{aligned}$$

where x is the quantity. Prove that you have a maximum. What is the maximum profit?

$\pi(x) = (500x - x^2) - (2000 + 196x + 3x^2)$
$= 304x - 4x^2 - 2000$

$\pi'(x) = 304 - 8x$

$304 - 8x = 0$
$-8x = -304$
$\boxed{x = 38 \text{ units}}$

π': (+) 38 (−)
1
π: ↗ ↘

Maximum Profit:
$\boxed{\pi(38) = \$3776}$