

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

$$C(x) = 2000 + 196x + 3x^2$$

$$R(x) = 500x - x^2$$

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

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

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

$$\begin{aligned} f'(x) &= 6x^2 - 6x - 12 \\ &= 6(x^2 - x - 2) \\ &= 6(x-2)(x+1) \end{aligned}$$

Compare:

$$\begin{aligned} f(-2) &= -3 \\ f(-1) &= 8 \text{ global max} \\ f(2) &= -19 \text{ global min} \\ f(3) &= -8 \end{aligned}$$

Critical Points: 2, -1

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

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

$$\begin{aligned} f'(x) &= 3x^2 - 18x + 15 \\ &= 3(x^2 - 6x + 5) \\ &= 3(x-5)(x-1) \end{aligned}$$

Compare:

$$\begin{aligned} f(0) &= 1 \\ f(1) &= 8 \\ f(5) &= -24 \text{ global min} \\ f(8) &= 57 \text{ global max} \end{aligned}$$

Critical Points: 5, 1

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

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

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

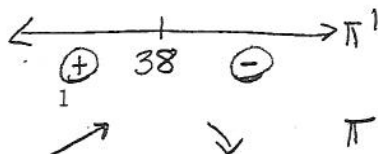
$$\begin{aligned} \pi(x) &= (500x - x^2) - (2000 + 196x + 3x^2) \\ &= 304x - 4x^2 - 2000 \end{aligned}$$

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

$$304 - 8x = 0$$

$$-8x = -304$$

$$x = 38 \text{ units}$$



Maximum Profit:

$$\pi(38) = \$3776$$