MATH 211 QUIZ 7 NAME SOLUTIONS

Prof. J. Beachy Friday, 10/25/02 Circle C1(T10) C2(T11) C3(Th11)

Average on quizzes and homework: Class average:

1. (10 pts; from Exam II) For the function $f(x) = x^3 - 3x^2 - 1$, find the absolute maximum and absolute minimum values on the interval $[-3, 3]$.

We need to test the values of the function at the end points $x = -3$ and $x = 3$ of the interval, together with the values of the function at all critical points.

$f'(x) = 3x^2 - 6x = 3x(x-2)$ Setting $f'(x) = 0$ we get $x = 0$ or $x = 2$.

$f(-3) = (-3)^3 - 3((-3)^2 - 1 = -27 - 27 - 1 = -55$

$f(0) = -1$

$f(2) = 2^3 - 3(2)^2 - 1 = 8 - 12 - 1 = -5$

$f(3) = (3)^3 - 3(3)^2 - 1 = -1$

The maximum values occur at $x = 0$ and $x = 3$.

2. (10 pts; p 249 Ex 1) A hobby store has 20ft. of fencing to fence off a rectangular area for an electric train in one corner of its display room. The two sides up against the wall require no fence. What dimensions of the rectangle will maximize the area? What is the maximum area?

This is an example in the text, so you can read the author's solution.

We need to maximize the area, so we need the area as a function of a variable x. Let x be the width of the rectangle. Then the length will use the rest of the fencing, so it will be $20 - x$.

Area: $A(x) = x(20 - x) = 20x - x^2$.

$A'(x) = 20 - 2x$ Setting $A'(x) = 0$ gives $x = 10$.

The graph of $A(x)$ is a parabola opening down, so we do not need to use calculus to see that $x = 10$ produces a maximum area. (Of course, the second derivative test is consistent. It shows that $A(x)$ is concave down for all x, since $A''(x) = -2$, verifying that $x = 10$ produces a maximum area.)

Answer: The area should measure 10 ft by 10 ft, with an area of 100 ft^2.