Math 220 AD9, Spring 2009, Quiz 6

Name: Solutions

1. (Q. 32(b), p. 275) Find the absolute extrema of the function $f(x) = x^4 - 8x^2 + 2$ on the interval $[-1, 3]$.

$f'(x) = 4x^3 - 16x = 4x(x+2)(x-2)$

Critical numbers $x = 0$, $x = +2$, $x = -2$.

On interval $[-1,3]$, so check at

$x = -1$, $x = 0$, $x = +2$, $x = +3$.

$f(-1) = 1 - 8 + 2 = -5$, $f(0) = 2$

$f(2) = 16 - 32 + 2 = -14$, $f(3) = 81 - 72 + 2 = 11$.

Absolute maximum: $f(3) = 11$.

Absolute minimum: $f(2) = -14$.

2. (Q. 2, p. 293) Determine the intervals where the graph of the function $f(x) = x^4 - 6x^2 + 2x + 3$ is concave up and concave down.

$f'(x) = 4x^3 - 12x + 2$

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

$f''(x) > 0$?

Concave up on $(-\infty, -1)$ and $(1, \infty)$

Concave down when $f''(x) < 0$,

on $(-1, +1)$.