MA 16010 Quiz 8 (Lessons 19–~~16~~ 20)

Write your name, section number (399 for 8:30, 418 for 9:30), and quiz number on the top of your quiz, **front and back.**

You may use a one–line calculator.

1. Find the maximal intervals where the function

$$f(x) = \cancel{8}\,3x^5 - \cancel{10}\,40x^3 + 7x - 11 \qquad f(x) = 3x^5 - 40x^3 + 7x - 11$$

is concave up and where it is concave down.

2. Find the absolute maximum and the absolute minimum of the function

$$f(x) = x^3 - 6x^2 - 15x + 4$$

on the interval $[-3, 3]$.

1. $f'(x) = 15x^4 - 120x^2 + 7$

$f''(x) = 60x^3 - 240x$

$60x^3 - 240x = 0$

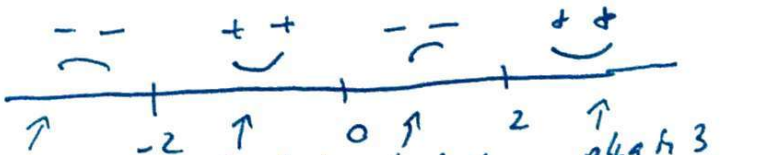
$x^3 - 4x = 0$

$x(x^2 - 4) = 0$

$x = 0$ or $x^2 - 4 = 0$

$x^2 = 4$

$x = \pm 2$



plug in -3: $-60 \cdot 27 + 240 \cdot 3 = -900 < 0$

plug in -1: $-60 + 240 > 0$

plug in 1: $60 - 240 < 0$

plug in 3: $60 \cdot 27 - 240 \cdot 3 = 900 > 0$

Concave up: $(-2, 0), (2, \infty)$

Concave down: $(-\infty, -2), (0, 2)$

2. $f'(x) = 3x^2 - 12x - 15$

$3x^2 - 12x - 15 = 0$

$x^2 - 4x - 5 = 0$

$x_{1,2} = \dfrac{4 \pm \sqrt{16 + 4 \cdot 5}}{2} = \dfrac{4 \pm \sqrt{36}}{2}$

$x_1 = 5$ ... disregard, 5 not in $[-3, 3]$

$x_2 = -1$

Evaluate:

$f(-1) = -1 - 6 + 15 + 4 = 12$

$f(-3) = -27 - 6 \cdot 9 + 15 \cdot 3 + 4 = -32$

$f(3) = 27 - 6 \cdot 9 - 15 \cdot 3 + 4 = -68$

max $(x, y) = (-1, 12)$

min $(x, y) = (3, -68)$