MTH 151
Quiz 5
Fall 2011

Show all work in a neat and organized fashion. Clearly indicate your answers.
20 points possible.

1. (5 pts.) Find the limit or show that it does not exist. (Support your answer with symbolic work.)

$$\lim_{x\to\infty} \frac{8x^2+3x-9}{7x^2-4x+5}$$

2. (5 pts.) Given:

$$\begin{aligned} f(x) &= \text{ some unknown continuous function with domain all of } \mathbb{R} \\ f'(x) &= \frac{5(x-2)}{3\sqrt[3]{x}} \\ f''(x) &= \frac{10(x+1)}{9\sqrt[3]{x^4}} \end{aligned}$$

(a) Find the intervals on which f is increasing or decreasing.

(b) Find the x-coordinates of all local maxima and local minima of f. For each answer, how do you know it is a local maximum/minimum?

3. (5 pts.) Given:

$$\begin{aligned} f(x) &= \text{ some unknown continuous function with domain all of } \mathbb{R} \\ f'(x) &= \text{ some unknown continuous function with domain all of } \mathbb{R} \\ f''(x) &= 4x(x+2)(x-2) \end{aligned}$$

(a) Find the intervals of concavity of f.

(b) Find the x-coordinates of all points of inflection of f. For each answer, how do you know it is an inflection point?

4. (6 pts.) A cylindrical can with both a circular bottom and a circular top is made to contain $250\,\text{cm}^3$ of liquid. What should be the radius of the circular base, if the surface area of the can is to be minimized? Justify why your answer gives an absolute minimum.

The formula for the volume of a cylinder is $V = \pi r^2 h$. The lateral surface area of a cylinder is $2\pi rh$. The area of a circle is πr^2.