

Score: \_\_\_\_ out of 20 points

This quiz is due at the beginning of class on Friday, 23 March. The work you hand in must be your own. Show all your work!

(12) 1. Let  $f(x) = 3x^4 - 4x^3 + 1$ .

(a) On which intervals is  $f$  decreasing?

(b) On which intervals is  $f$  increasing?

(c) Identify any local maximum and minimum values, and the points at which they occur, of  $f$ .

(d) On which intervals is the graph of  $f$  concave upward?

(e) On which intervals is the graph of  $f$  concave downward?

(f) Identify any points of inflection of the graph of  $f$ .

(4) 2. Let  $f(x) = x + \frac{4}{x}$ .

(a) Find all the critical points of  $f$ .

(b) Use the second derivative test to classify the critical points of  $f$  (that is, identify them as the location of local maximums, local minimums, or neither).

(4) 3. Evaluate the following limits, carefully showing all steps in your work:

(a)  $\lim_{x \rightarrow \infty} \frac{5x^2 - 15x + 7}{8x^2 + 3x - 9}$

(b)  $\lim_{x \rightarrow -\infty} \frac{3x}{\sqrt{2x^2 + 1}}$