

Name: \_\_\_\_\_ / 25

There are 25 points possible on this quiz. *You should be able to complete it without using your notes or textbook or a calculator — this is practice for your exams!* If you needed to look something up, you should to me about questions you might have. **Show all work for full credit** and use some words or sentences to help communicate your answers.

1. [12 points] The following questions concern the function  $k(x) = \frac{3}{2}x^4 - 3x^3$ . You must **show all your work** and explain your answers. Here are the first and second derivatives of  $k(x)$ :

$$k'(x) = 6x^3 - 9x^2; \quad k''(x) = 18x^2 - 18x.$$

- Identify all critical points of  $k(x)$ .
- Determine intervals where  $k(x)$  is increasing or decreasing.
- Identify the location ( $x$ -values) of any local maxima or minima of  $k(x)$  or state that none exist.
- Determine intervals where  $k(x)$  is concave up and concave down.
- Identify the  $x$ -values of any inflection points of  $k(x)$  or state that none exist.

2. [8 points] Evaluate the limits below. **You must justify your answer algebraically to receive full credit.** (This means: show your work, using calculus skills and techniques.)

a.  $\lim_{x \rightarrow -\infty} \frac{6x^3 - 4x^2 + 5}{10 - 2x - 8x^3}$

b.  $\lim_{x \rightarrow \infty} \frac{4x - 2}{\sqrt{5x^2 - 4}}$

3. [5 points] Let  $f(x) = \frac{2x^2 + 7x + 6}{x^2 - 4x + 4} = \frac{(2x + 3)(x + 2)}{(x - 2)^2}$

- a. Give the equation of any vertical asymptotes and **justify your answer using limits and the calculus definition of a vertical asymptote.**
- b. Give the equation of any horizontal asymptotes and **justify your answer using limits and the calculus definition of a horizontal asymptote.**