Name: _____ _____ / 25

There are 25 points possible on this quiz. No aids (book, calculator, etc.) are permitted. **Show all work for full credit.**

1. [11 points] Let $g(x) = \frac{3}{2}x^4 - 3x^3$. Note that we have the following:

$$g'(x) = 6x^3 - 9x^2 \qquad g''(x) = 18x^2 - 18x$$

You must show your work for all parts to receive credit!

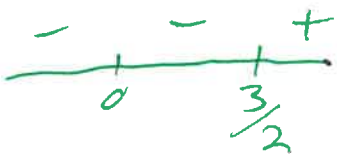
a. Determine the intervals where g is **increasing** and where g is **decreasing**.

$g'(x) = 0$

$6x^3 - 9x^2 = 0$

$3x^2(2x-3) = 0$

$x = 0, \; x = \frac{3}{2}$



decreasing: $(-\infty, \frac{3}{2})$

increasing: $(\frac{3}{2}, \infty)$

b. Find the x values where any **local maxima** occur and where any **local minima** occur.

local max: none

local min at $x = \frac{3}{2}$

c. Find the intervals where g is **concave up** and where g is **concave down**.

$g''(x) = 0$

$18x^2 - 18x = 0$

$18x(x-1) = 0$

$x = 0, \; x = 1$

conc up: $(-\infty, 0) \cup (1, \infty)$

conc down: $(0, 1)$

d. Find the x values where any **inflection points** occur.

$x = 0, \; x = 1$

2. [8 points] Evaluate the following limits. **Show your work!**

a. $\lim_{x\to-\infty} \dfrac{x^2+1}{x^2-2x^3}$

$= \lim_{x\to-\infty} \dfrac{x^2+1}{x^2-2x^3} \cdot \dfrac{\left(\frac{1}{x^3}\right)}{\left(\frac{1}{x^3}\right)}$

$= \lim_{x\to-\infty} \dfrac{\frac{x^2}{x^3}+\frac{1}{x^3}}{\frac{x^2}{x^3}-\frac{2x^3}{x^3}}$

$= \lim_{x\to-\infty} \dfrac{\frac{1}{x}+\frac{1}{x^3}}{\frac{1}{x}-2} = \dfrac{0}{-2} = \boxed{0}$

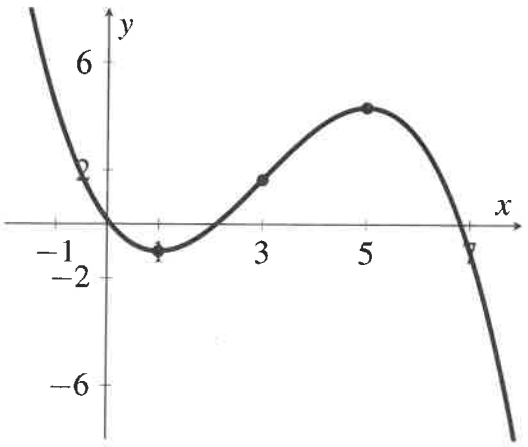
b. $\lim_{x\to\infty} \dfrac{4x-2}{\sqrt{5x^2-4}}$

$= \lim_{x\to\infty} \dfrac{4x-2}{\sqrt{5x^2-4}} \cdot \dfrac{\left(\frac{1}{x}\right)}{\left(\frac{1}{x}\right)}$

$= \lim_{x\to\infty} \dfrac{\frac{4x}{x}-\frac{2}{x}}{\sqrt{\frac{5x^2}{x^2}-\frac{4}{x^2}}}$

$= \lim_{x\to\infty} \dfrac{4-\frac{2}{x}}{\sqrt{5-\frac{4}{x^2}}} = \boxed{\dfrac{4}{\sqrt{5}}}$

3. [6 points] Based on the graph of the function $f(x)$ below, determine whether each value is positive, negative, zero, or undefined. You do not need to show your work.



a. $g'(1) = 0$

b. $g''(1) > 0$

c. $g'(3) > 0$

d. $g''(3) = 0$

e. $g'(5) = 0$

f. $g''(5) < 0$