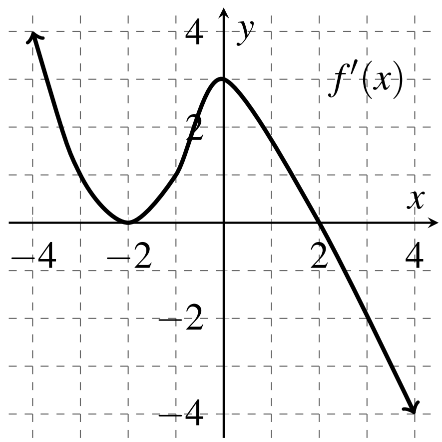
Name: ____________________ ________ / 25

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

1. **[5 points]** Below is the graph of the **derivative** of f, $f'(x)$. Use this graph to answer the questions.



a. On what interval(s) is $f(x)$ increasing?

$(-\infty, 2)$ (where $f' > 0$)

b. Determine where $f(x)$ has a local maximum or a local minimum or state that one does not exist.

local max at $x=2$, no local min

c. On what interval(s) is $f(x)$ concave up?

$(-2, 0)$ (where f' is increasing)

d. Determine the location of any inflection points of f.

$x=-2$ and $x=0$

2. **[10 points]** Evaluate the limit. Give the most complete answer possible. If the limit is ∞ or $-\infty$, state this. You must justify your answer algebraically. Answers without any work will not receive full credit.

a. $\lim_{x\to\infty} \frac{10x^4 - x}{x^2 - 2x^4} \cdot \frac{\frac{1}{x^4}}{\frac{1}{x^4}} = \lim_{x\to\infty} \frac{10 - \frac{1}{x^3}}{\frac{1}{x^2} - 2} = -5$

$\frac{1}{x^3} \to 0$, $\frac{1}{x^2} \to 0$

b. $\lim_{x\to-\infty} \frac{\sqrt{3x^2+1}}{2x^2-5} \cdot \frac{1/x^2}{1/x^2} = \lim_{x\to-\infty} \frac{-\sqrt{\frac{3}{x^2} + \frac{1}{x^4}}}{2 - \frac{5}{x^2}} = \frac{0}{2} = 0$

3. [10 points] On the axes below, sketch a graph of a function f having all of the given characteristics.

a. $f(-1) = f(3) = 0$

b. $f'(x) < 0$ for $x < 1$

c. $f'(1) = 0$

d. $f'(1) > 0$ for $x > 1$

e. $f''(x) > 0$ for $x < 3$

f. $f''(x) < 0$ for $x > 3$

g. $\lim_{x\to\infty} f(x) = 2$