MAC 2311: Worksheet #1

Panther ID: _____   NAME: _____

1) Consider the function $f(x) = x^2 - 4x$.
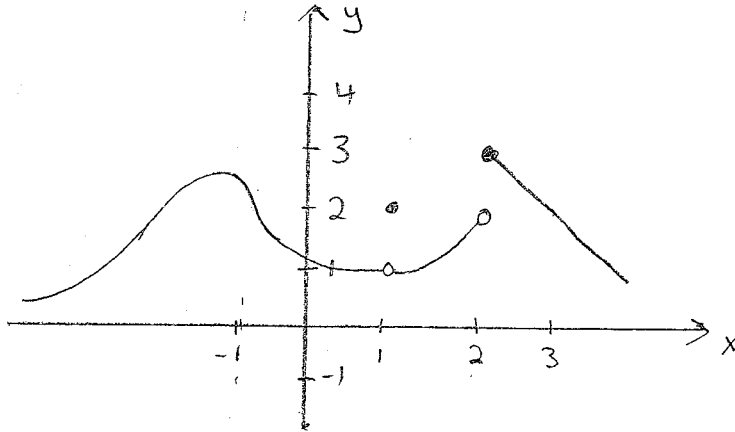
  a) Sketch the graph of $y = f(x)$.

(d) Find the slope of the tangent line to the graph at a point x_0.

  b) Find the average rate of change of $f(x)$ with respect to x over the interval $[2, 4]$.

  c) On your graph in part (a), sketch the line between the points $(2, f(2))$ and $(4, f(4))$. What is the slope of this line?

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3) Compute the limits, if the graph of $y = g(x)$ is given as follows,

a) $\lim_{x \to -1} g(x)$ b) $\lim_{x \to 1} g(x)$ c) $\lim_{x \to 2} g(x))$

4) Define

$$f(x) = \begin{cases} x^2 - 1 & \text{if } x \leq 2 \\ x + 1 & \text{if } x > 2 \end{cases}$$

Compute the following limits or explain why they don't exist:

a) $\lim_{x \to 2^-} f(x)$

b) $\lim_{x \to 2^+} f(x)$

c) $\lim_{x \to 2} f(x)$

5) Compute $\lim_{x \to 1}(x-1)/|x-1|$ or explain why it doesn't exist.

6a) Sketch the graph $y = \frac{1}{x^2-1}$. (Hint: first sketch $y = x^2 - 1$.)
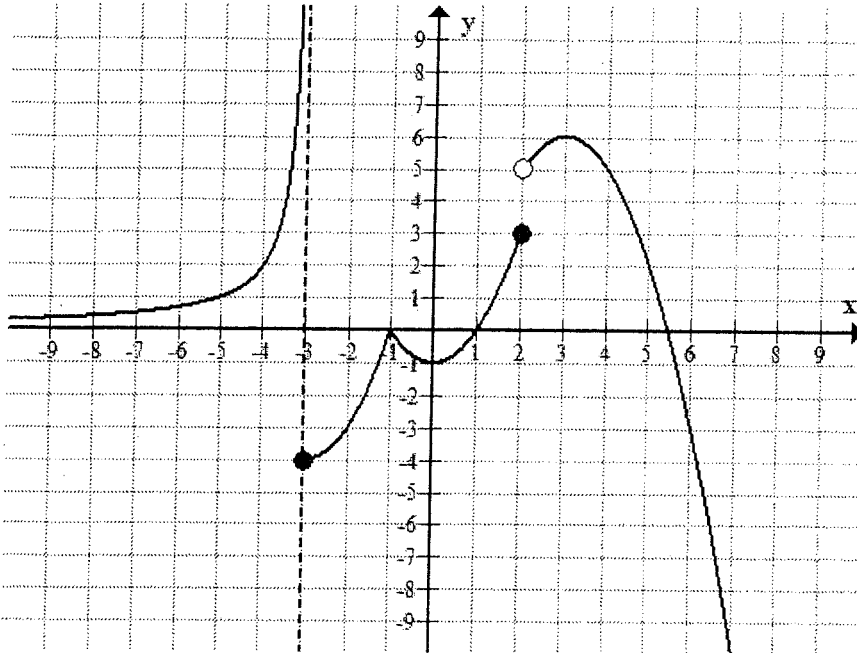
Use this graph to compute:

b) $\lim_{x \to 1^-} \frac{1}{x^2-1}$

c) $\lim_{x \to 1^+} \frac{1}{x^2-1}$

d) $\lim_{x \to 1} \frac{1}{x^2-1}$

7) Compute $\lim_{x \to 1} \frac{x-1}{x^2-1}$

Problem 2 The graph of a function *f* is given below. Use the graph to find the limits below. Specify if a limit does not exist or is infinite.

$$\lim_{x \to -3^-} f(x) =$$ $$\lim_{x \to -3^+} f(x) =$$ $$\lim_{x \to -3} f(x) =$$ $$\lim_{x \to 3} f(x) =$$

$$\lim_{x \to 2^-} f(x) =$$ $$\lim_{x \to 2^+} f(x) =$$ $$\lim_{x \to 2} f(x) =$$

$$\lim_{x \to -1} f(x) =$$ $$\lim_{x \to -\infty} f(x) =$$ $$\lim_{x \to +\infty} f(x) =$$

Problem 9. Sketch the graph of a function $y = f(x)$ which satisfies **all** of the following conditions:

(i) the domain of *f* is (0, +∞); (ii) $f(2) = f(4) = 0$;

(iii) $\lim_{x \to 0^+} f(x) = -\infty$; (iv) $\lim_{x \to 2} f(x) = +\infty$;

(v) $\lim_{x \to 4^-} f(x) = 0$ and $\lim_{x \to 4^+} f(x) = 1$;

(vi) $\lim_{x \to +\infty} f(x) = 3.$