Problem 1: (15 points) If it exists, find the limit. Use the symbols $\infty$ or $-\infty$ as appropriate.

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

b) $\lim_{x \to 3} \ln(x - 3)$

c) $\lim_{y \to 0} \frac{4y + y^2}{3y - y^2}$

d) $\lim_{x \to 5^+} \left( x - \left\lfloor x \right\rfloor \right)$

e) $\lim_{x \to 0^+} \frac{\sqrt{x^2 + 9} - 3}{x^2}$

Problem 2: (5 points) Consider the graph of the function $f(x)$ whose graph is sketched below. Determine whether each of the following statements is true or false (CIRCLE ONE).

a. $\lim_{x \to 1} f(x) = 1$ T F
b. $\lim_{x \to 1} f(x) = f(1)$ T F
c. $\lim_{x \to 0} f(x)$ does not exist. T F
d. $\lim_{x \to 1} f(x) = \infty$ T F
e. $f(x)$ has a vertical asymptote T F

Problem 3: (5 points) Use the $\epsilon - \delta$ definition of the limit to show that $\lim_{x \to 2} (1 - 2x) = -3$. 

Problem 1: (15 points) If it exists, find the limit. Use the symbols $\infty$ or $-\infty$ as appropriate.

a) \[ \lim_{x \to 1^+} \frac{x^2 - x}{x - 1} \]

b) \[ \lim_{x \to 2} \ln (2 - x) \]

c) \[ \lim_{y \to 0} \frac{5y + y^2}{3y - y^2} \]

d) \[ \lim_{x \to 4^+} \left( x - \lfloor x \rfloor \right) \]

e) \[ \lim_{x \to 1^+} \frac{\sqrt{x + 3} - 2}{x - 1} \]

Problem 2: (5 points) Consider the graph of the function $f(x)$ whose graph is sketched below. Determine whether each of the following statements is true or false (CIRCLE ONE).

a. \[ \lim_{x \to 1} f(x) = -1 \] T F

b. \[ \lim_{x \to 1} f(x) = f(1) \] T F

c. \[ \lim_{x \to 0} f(x) \] does not exist. T F

d. \[ \lim_{x \to 1} \frac{f(x)}{x - 1} = -\infty \] T F

e. \[ f(x) \] has a vertical asymptote T F

Problem 3: (5 points) Use the $\varepsilon - \delta$ definition of the limit to show that \[ \lim_{x \to 2} (2 - 3x) = -4. \]