1. Let \( f(x) = \frac{x^2 - 5x + 6}{x^2 - x - 6} \).

   (a) The function \( f \) has a removable discontinuity at \( x = 3 \). Compute \( \lim_{x \to 3} f(x) \). You must show your work and use proper limit notation for full credit.

   \[
   \lim_{x \to 3} \frac{x^2 - 5x + 6}{x^2 - x - 6} = \lim_{x \to 3} \frac{(x - 3)(x - 2)}{(x - 3)(x + 2)} = \lim_{x \to 3} \frac{x - 2}{x + 2} = \frac{3 - 2}{3 + 2} = \frac{1}{5}
   \]

2. Does \( \lim_{x \to 4} \frac{4x - 3}{x^2 - 4} \) exist? Explain your answer.

   If we input the value \( x = 4 \) into the denominator, we DO NOT get output 0. Therefore, the rational function \( f(x) = \frac{4x - 3}{x^2 - 4} \) is continuous at \( x = 4 \). This tells us that the limit in question exists. In fact, the direct substitution principle tells us

   \[
   \lim_{x \to 4} \frac{4x - 3}{x^2 - 4} = \frac{4(4) - 3}{4^2 - 4} = \frac{13}{12}
   \]

3. Use the graph of the function \( f \) below to decide whether each limit exists. If it does, find the value; if not, explain why.

   (a) \( \lim_{x \to 2} f(x) = 2 \)  
   (b) \( \lim_{x \to 4^-} f(x) \approx 4.5 \)  
   (c) \( \lim_{x \to 4^+} f(x) = 3 \)

   (d) \( \lim_{x \to 3} f(x) = 3 \)  
   (e) \( \lim_{x \to -1^+} f(x) = 5 \)  
   (f) \( \lim_{x \to 4} f(x) \) DNE

The limit in Part (f) does not exist because there is a jump discontinuity in the graph of \( f \) at the input value \( x = 4 \). As a result, the values of the left-hand limit does not agree with the value of the right-hand limit.