1) a) A function is a set of rules that associates every element from a set \( A \) to exactly one, and only one, element from set \( B \).

b) \( \lim_{x \to a} f(x) = L \) if and only if for each \( \epsilon > 0 \) there exists \( \delta > 0 \) such that if \( 0 < |x - a| < \delta \) then \( |f(x) - L| < \epsilon \).

2) Find a \( \delta \) corresponding to every \( \epsilon > 0 \) such that:

\[ 0 < |x - 3| < \delta \text{ then } |10 - 3x - 1| < \epsilon \]

\[ \leq |9 - 3x| < \epsilon \]

\[ = |3(x - 3)| < \epsilon \]

\[ = |3||x - 3| < \epsilon \]

\[ = |x - 3| < \frac{\epsilon}{3}. \]

So, let \( \delta = \frac{\epsilon}{3} \).

3) a) \( 3 \) b) \( 3 \) c) \( 3 \) d) \( \infty \) e) does not exist because left \( \neq \) right limit are not equal.

4) [Graph drawing showing a function with a shift to the right and 2 up.]

5) a) \( \lim_{x \to 3} \frac{x^2 + 2x - 15}{9 - x^2} = \frac{(x-3)(x+5)}{(3-x)(3+x)} = \frac{(-1)(x+5)}{(x+3)} = \frac{-2}{2} \)

b) \( \lim_{x \to 4} \frac{x-4}{\sqrt{x} - 2} = \frac{(x-4)(\sqrt{x} + 2)}{x - 4} = \frac{(\sqrt{x})(\sqrt{x} + 2)}{x - 4} = \sqrt{x} + 2 = 4 \)

c) \( \lim_{x \to \frac{\pi}{4}} \sec \left( \frac{x}{4} \right) = \frac{1}{\cos \left( \frac{\pi}{4} \right)} = \frac{1}{\cos \frac{\pi}{4}} = \frac{1}{\frac{\sqrt{2}}{2}} = \frac{\sqrt{2}}{2} \)
6) a) \( \lim_{{x \to -5}} 6 + \sqrt{10+2(x)} = 6 - 5 \)  
   \[ \text{problem - so check domain...} \]
   \[ \text{domain in } 10 + 2x > 0 \Rightarrow x > -5, \text{ so the left limit doesn't exist, so neither does the two sided limit.} \]

b) \( \lim_{{x \to 3^+}} \frac{3+x}{6-2x} = \frac{3+3^+}{6-2\cdot3^+} = \frac{6}{0^-} = \boxed{-\infty} \)

c) \( \lim_{{x \to 100}} 15 = \boxed{15} \) by theorem.

7) a) \( f(2) \) is undefined.

b) \( \lim_{{x \to 2}} f(x) \) exists only if left \& right limits agree.

\( \lim_{{x \to 2^-}} f(x) = 3(2)^2 - 1 = 11 \)
\( \lim_{{x \to 2^+}} f(x) = 2 + 9 = 11 \)

They agree, so \( \boxed{\lim_{{x \to 2}} f(x) = 11} \)

c) \( f(5) = 5 + 9 = 14 \)

d) Right limit at \( x = 5 \) doesn't exist, so 2-sided limit doesn't exist either.