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

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

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② Find a δ corresponding to every $\epsilon>0$ such that:

if $0<|x-3|<\delta$ then $|10-3x-1|<\epsilon$

$$\equiv |9-3x|<\epsilon \equiv |-3(x-3)|<\epsilon$$

$$\equiv |-3|\,|x-3|<\epsilon \equiv |x-3|<\frac{\epsilon}{3}.$$

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

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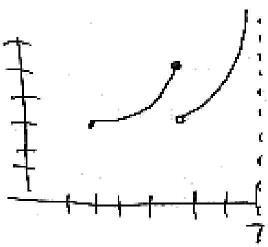
③ a) 3 b) 3 c) 1 d) ∞ e) doesn't exist because left & right limits are not equal.

f) 

shift graph 3 to the right and 2 up.

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④ a) 11 b) $\frac{1}{(1-2x)^2-4}=\frac{1}{4x^2-4x-3}$ c) $x\neq\pm 2$

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⑤ a) $\lim_{x\to 3}\frac{x^2+3x-18}{9-x^2}=\frac{(x-6)\cancel{(x-3)}^{-1}}{\cancel{(3-x)}(3+x)}=\frac{(-1)(x-6)}{(3+x)}=\frac{(-1)(3-6)}{(3+3)}=\frac{-9}{6}$

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

c) $\lim_{x\to \frac{5}{4}\pi}\sec x=\sec\left(\frac{5}{4}\pi\right)=\frac{1}{\cos\left(\frac{5}{4}\pi\right)}$ 45° $=\frac{1}{-\cos 45°}=\frac{1}{\left(-\frac{1}{\sqrt{2}}\right)}=-\sqrt{2}$

⑥ a) $\lim_{x \to -5} 6 + -\sqrt{10 + 2(-5)} = 6 - \sqrt{0}$

problem - so check domain...

domain is $10 + 2x \geq 0 \Rightarrow x \geq -5$, so the left limit doesn't exist, so neither does the two sided limit.

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

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

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⑦ a) $f(2)$ is undefined

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

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

they agree, so $\lim_{x \to 2} f(x) = \underline{\underline{11}}$

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

d) right limit at $x = 5$ doesn't exist, so 2 sided limit doesn't either.