Evaluate each limit. Show your work or explain your reasoning.

1. $\lim_{h\to 0}\frac{(-9+h)^2-81}{h}$ $= \lim_{h\to 0}\frac{81-18h+h^2-81}{h} = \lim_{h\to 0}\frac{-18h+h^2}{h} = \lim_{h\to 0} -18+h$

$= \underline{\underline{-18}}$

2. $\lim_{t\to 8}(1+\sqrt[3]{t})(2-t^2)$ $= (1+\sqrt[3]{8})(2-8^2) = 3(-62) = \underline{\underline{-186}}$

3. $\lim_{\theta\to 4}\frac{\theta^2-4\theta}{\theta^2-\theta-12}$ $= \lim_{\theta\to 4}\frac{\theta(\theta-4)}{(\theta+3)(\theta-4)} = \lim_{\theta\to 4}\frac{\theta}{\theta+3} = \frac{4}{7}$

plug in $\theta=4$, get $\frac{0}{0}$. So factor!

4. $\lim_{x\to 4}\frac{x^2}{x^2-x-12}$ $=$ DNE

as $x\to 0$, $x^2\to 4$

as $x\to 0^+$ $(x+3)(x-4)\to 0^+$

as $x\to 0^-$ $(x+3)(x-4)\to 0^-$

So $\lim_{x\to 4^+}\frac{x^2}{x^2-x-12} = +\infty$

$\lim_{x\to 4^-}\frac{x^2}{x^2-x-12} = -\infty$

5. $\lim_{x\to -3}\frac{\frac{1}{3}+\frac{1}{x}}{x+3}$ $= \lim_{x\to -3}\left[\frac{1}{x+3}\left(\frac{x+3}{3x}\right)\right] = \lim_{x\to -3}\frac{1}{3x} = \frac{-1}{9}$

when plug in $x=-3$, get $\frac{0}{0}$.

Do algebra!

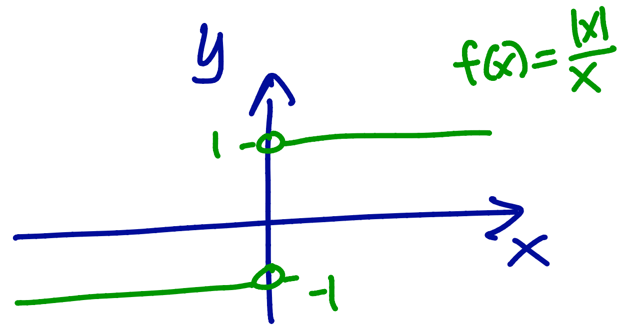
get a common denominator

6. $\lim_{x\to 0^-} \frac{|x|}{x}$ $= \lim_{x\to 0^-} \frac{-x}{x} = \lim_{x\to 0^-} -1 = -1$

as $x \to 0^-$, $x<0$. So $|x| = -x$

7. $\lim_{x\to 0} \frac{|x|}{x}$ $=$ DNE

$\lim_{x\to 0^+} \frac{|x|}{x} = \lim_{x\to 0^+} \frac{x}{x} = \lim_{x\to 0^+} 1$



8. $\lim_{x\to 5^-} \frac{3x-15}{|5-x|}$ $= \lim_{x\to 5^-} \frac{3(x-5)}{|5-x|} = \lim_{x\to 5^-} \frac{3(x-5)}{5-x} = \lim_{x\to 5^-} \frac{-3(5-x)}{5-x} = -3$

as $x\to 5^-$, $5-x>0$.
So $|5-x| = 5-x$

9. $\lim_{x\to \pi} \frac{2x}{\tan^2 x}$ $= +\infty$

as $x \to \pi$, $2x \to 2\pi$
and $\tan^2 x \to 0^+$