Limits to "As x approaches a number" HW **Name:** KEY

Find the following limits algebraically:

1) $\lim_{x\to 3}\left(x^3-2x^2\right)=$ $3^3-2(3)^2=27-2(9)=\boxed{9}$

2) $\lim_{x\to 2}\frac{x^2+2x+4}{x+2}=$ $\frac{4+4+4}{2+2}=\boxed{3}$

3) $\lim_{x\to 0}\frac{1}{x^2}=$ $\frac{1}{0}$ V.A.

$\lim_{x\to 0^+}\frac{1}{x^2}=\frac{+}{+}$

$\lim_{x\to 0^-}\frac{1}{x^2}=\frac{+}{+}$

$\lim_{x\to 0}\frac{1}{x^2}=\boxed{+\infty}$

4) $\lim_{x\to -3}\sqrt{x-3}=$ $\sqrt{-3-3}\Rightarrow$ DNE !!

5) $\lim_{x\to 0}\frac{(5+x)^2-25}{x}=$ $\frac{(5)^2-25}{0}=\frac{0}{0}$ hole!

$\frac{25+10x+x^2-25}{x}=\frac{x(10+x)}{x}$

$\lim_{x\to 0}10+x=\boxed{10}$

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6) $\lim_{x\to 3}\left(\frac{\frac{1}{x}-\frac{1}{3}}{x-3}\right)=$ $\frac{0}{0}$ hole! $\frac{\frac{3}{3x}-\frac{x}{3x}}{x-3}=\frac{\frac{3-x}{3x}}{x-3}=\frac{3-x}{3x}\cdot\frac{1}{x-3}$

$=-\frac{1}{3x}\Rightarrow\lim_{x\to 3}-\frac{1}{3x}=\boxed{-\frac{1}{9}}$

7) $\lim_{x\to -5}\frac{x^2-7x+14}{x-5}=$ $\frac{25+35+14}{-10}=\frac{74}{-10}=-\frac{37}{5}=\boxed{-7.4}$

8) $\lim_{x\to 0}\frac{x}{x^2-x}=$ $\frac{0}{0}$ hole! $\frac{x}{x(x-1)}\Rightarrow\lim_{x\to 0}\frac{1}{x-1}=\boxed{-1}$

9) $\lim_{x\to 12}\frac{\sqrt{x-3}-3}{x-12}=$ $\frac{\sqrt{9}-3}{0}=\frac{0}{0}$ hole! $\frac{\sqrt{x-3}-3}{x-12}\left(\frac{\sqrt{x-3}+3}{\sqrt{x-3}+3}\right)=\frac{(x-3)-9}{(x-12)(\sqrt{x-3}+3)}$

$\Rightarrow\lim_{x\to 12}\frac{1}{\sqrt{x-3}+3}=\frac{1}{3+3}=\boxed{\frac{1}{6}}$

10) $\lim_{x\to 2}\frac{x^3-8x+8}{x+8}=$ $\frac{8-16+8}{2+8}=\boxed{0}$

11) $\lim_{x\to 2}(6)=$ $\boxed{6}$

12) $\lim_{x\to -2}\frac{x^2+2x+4}{x+2}=$ $\frac{4-4+4}{0}=\frac{4}{0}$ V.A.!

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

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

$\lim_{x\to 2}\frac{x^2+2x+4}{x+2}=$ DNE

13) $\lim_{x\to 0}\frac{7}{x^2+7x-7}=$ $\frac{7}{-7}=$ -1

14) $f(x)=\begin{cases} x-1 & x\le 0 \\ x+5 & x>0 \end{cases}$

$\lim_{x\to 0} f(x)=$

$\lim_{x\to 0^+} x+5=5$

$\lim_{x\to 0^-} x-1=-1$

do not match,

so $\lim_{x\to 0} f(x)=$ DNE