a. $$\lim_{x\to 0} \frac{0^2-25}{0^2-4(0)-5} = \frac{-25}{-5} = 5$$

b. $$\lim_{x\to 5} \frac{(x+5)\cancel{(x-5)}}{\cancel{(x-5)}(x+1)} = \frac{x+5}{x+1} = \frac{10}{6} = 5/3$$

c. $$\lim_{x\to 1} \frac{(7x+3)\ \cancel{(x-1)}}{(3x-1)\ \cancel{(x-1)}} = \frac{7x+3}{3x-1} = \frac{7+3}{3-1} = 5$$

d. $$\lim_{x\to -2} \frac{x^2(x^2+5x+6)}{x^2(x+1)-4(x+1)} = \frac{x^2(x+3)(x+2)}{(x^2-4)(x+1)}$$

*factor by grouping

$$\frac{x^2(x+3)\cancel{(x+2)}}{\cancel{(x+2)}(x-2)(x+1)} = \frac{x^2(x+3)}{(x-2)(x+1)} = \frac{4(1)}{(-4)(-1)} = 1$$

e. $$\lim_{x\to -3} |-3+1| + \frac{3}{-3} = |-2| - 1 = 2-1 = 1$$

f. $$\lim_{x\to 3} \frac{\sqrt{x+1}-2}{x^2-9} \cdot \frac{\sqrt{x+1}+2}{\sqrt{x+1}+2} = \frac{x+1-4}{(x^2-9)(\sqrt{x+1}+2)}$$

$$= \frac{\cancel{x-3}}{\cancel{(x-3)}(x+3)(\sqrt{x+1}+2)} = \frac{1}{(x+3)(\sqrt{x+1}+2)} = \frac{1}{6\cdot 4} = \frac{1}{24}$$

g. $$\lim_{x\to 3} \frac{\sqrt{x^2+7}-3}{x+3} \cdot \cancel{\frac{\sqrt{x^2+7}+3}{\sqrt{x^2+7}+3} = \frac{x^2+7-9}{(x+3)(\sqrt{x^2+7}+3)}} = 1/6$$

Substitution!

h. $$\lim_{x\to 2} \frac{x^2+2x-8}{\sqrt{x^2+5}-(x+1)} \cdot \frac{\sqrt{x^2+5}+(x+1)}{\sqrt{x^2+5}+(x+1)} = \frac{(x+4)(x-2)(\sqrt{x^2+5}+(x+1))}{x^2+5-(x+1)(x+1)}$$

$$= \frac{(x+4)(x-2)(\sqrt{x^2+5}+(x+1))}{x^2+5-(x^2+2x+1)} = \frac{(x+4)(x-2)(\sqrt{x^2+5}+(x+1))}{-2x+4}$$

$$= \frac{(x+4)\cancel{(x-2)}(\sqrt{x^2+5}+(x+1))}{-2\cancel{(x-2)}} = \frac{(x+4)(\sqrt{x^2+5}+(x+1))}{-2}$$

$$= \frac{6((3)+3)}{-2} = \frac{36}{-2} = \boxed{-18}$$

$$\cancel{g.\ \lim_{x\to 3} \frac{\sqrt{9+7}-3}{6} = \frac{1}{6}}$$

i. $$\lim_{y\to 5} \left(\frac{2(5)^2+2(5)+4}{6(5)-3}\right)^{1/3} = \left(\frac{64}{27}\right)^{1/3} = \boxed{\frac{4}{3}}$$

j. $$\lim_{x\to 0} \sqrt[4]{2\cos(0)-5} = \sqrt[4]{-3} = \boxed{\text{DNE}}$$

K. $$\lim_{x\to 0} \frac{\frac{3-x}{3-x}\cdot\frac{1}{3+x} - \frac{1}{3-x}\cdot\frac{3+x}{3+x}}{x} = \frac{\frac{3-x-(3+x)}{(3+x)(3-x)}}{x}$$

$$= \frac{\frac{-2x}{(3+x)(3-x)}}{x} = \frac{-2\cancel{x}}{(3+x)(3-x)} \cdot \frac{1}{\cancel{x}} = \frac{-2}{(3+x)(3-x)} = \boxed{-2/9}$$

l. $\lim_{x\to -6} \dfrac{\frac{x}{x}\cdot\frac{2x+8}{x^2-12} - \frac{1}{x}\cdot\frac{x^2-12}{x^2-12}}{x+6} = \dfrac{\frac{2x^2+8x-x^2+12}{x(x^2-12)}}{x+6}$

$= \dfrac{\frac{x^2+8x+12}{x(x^2-12)}}{x+6} = \dfrac{\cancel{(x+6)}(x+2)}{x(x^2-12)}\cdot\dfrac{1}{\cancel{(x+6)}} = \dfrac{x+2}{x^3-12x}$

$= \dfrac{-6+2}{(-6)^3-12(-6)} = \dfrac{-4}{-216+72} = \cancel{\dfrac{-4}{-648}} = \cancel{\dfrac{1}{162}}\ \dfrac{4}{140} = \dfrac{1}{36}$

m. $\lim_{x\to\infty} \sqrt{x^2-2} - \sqrt{x^2+1} = \sqrt{\infty^2-2} - \sqrt{\infty^2+1} = 0$

n. $\lim_{x\to-\infty} \sqrt{-\infty-2} - \sqrt{-\infty} =$ DNE

o. $\lim_{x\to 7} \sqrt[6]{2x-14} = \sqrt[6]{0} =$ DNE $\times$

p. $\lim_{x\to 1} \sqrt{3-3(1)} = 0$

q. $\lim_{x\to\infty} \dfrac{x^4-10}{4x^3+x} = \dfrac{\infty^4-10}{4\infty^3+(\infty)} = \dfrac{\infty^4+\dots}{4\infty^3+\dots} = \dfrac{1\cdot\infty}{4} = \infty$

r. $\lim_{x \to -\infty} \sqrt[3]{\frac{x-3}{5-x}} = \sqrt[3]{\frac{-\infty-3}{5+\infty}} = \sqrt[3]{\frac{-\infty}{\infty}}$

$= \sqrt[3]{-1} = -1$

s. $\lim_{x \to \infty} \frac{3x^3 + \cancel{x} \ldots}{-2x^3 + \ldots} = -\frac{3}{2}$

t. $\lim_{x \to \infty} \frac{x+5}{2x^2+1} \Rightarrow \frac{x}{2x^2} = \frac{1}{2x} = \frac{1}{2\infty} = 0$

u. $\lim_{x \to -\infty} \cos\left(\frac{x^5}{x^6}\right) = \cos\left(\frac{1}{x}\right) = \cos\left(\frac{1}{-\infty}\right)$

$= \cos 0 = 1$

v. $\lim_{x \to 2} \frac{2x}{(x+2)(x-2)} = \text{DNE}$

w. $\lim_{x \to -1} \frac{3x}{(x+1)(x+1)} = -\infty$

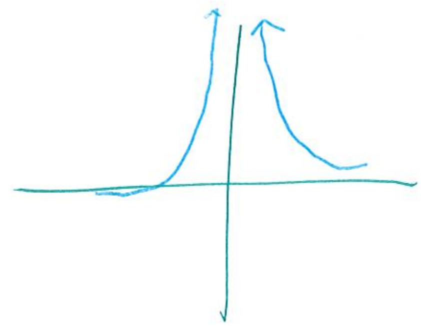
x. $\lim_{x \to -1} \frac{(x+5)\cancel{(x-5)}}{\cancel{(x-5)}(x+1)} = \frac{x+5}{x+1} =$ DNE

y. $\lim_{x \to 3} \frac{\sqrt{x^2-5}+2}{x-3} \cdot \frac{\sqrt{x^2-5}-2}{\sqrt{x^2-5}-2} = \frac{x^2-5-4}{(x-3)(\sqrt{x^2-5}-2)} = \frac{(x+1)(x-1)}{} =$ DNE

Z. $\lim\limits_{x\to 0} \dfrac{2^x+\sin x}{x^4}$

$= \boxed{\infty}$

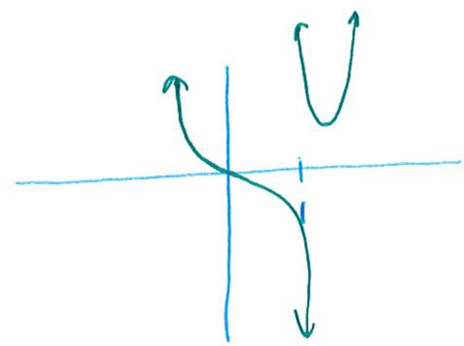
GRAPH:



A. $\lim\limits_{x\to 1^-} \dfrac{1}{x-1} + e^{x^2}$

$= \boxed{-\infty}$

GRAPH:



B. $\lim\limits_{x\to\infty} 2x^2-3x = \underset{\substack{\uparrow \\ \text{bigger} \\ \text{infinity}}}{2\infty^2} - \underset{\substack{\uparrow \\ \text{smaller} \\ \text{infinity}}}{3\infty} = \boxed{\infty}$

C. $\lim\limits_{x\to 0} \dfrac{\sqrt{x+2}-\sqrt{2-x}}{x} \cdot \dfrac{\sqrt{x+2}+\sqrt{2-x}}{\sqrt{x+2}+\sqrt{2+x}} = \dfrac{x+2-(2-x)}{x\left(\sqrt{x+2}+\sqrt{2-x}\right)}$

$= \dfrac{2\cancel{x}}{\cancel{x}\left(\sqrt{x+2}+\sqrt{2-x}\right)} = \dfrac{2}{\sqrt{x+2}+\sqrt{2-x}} = \dfrac{2}{\sqrt{2}+\sqrt{2}} = \dfrac{\cancel{2}}{\cancel{2}\sqrt{2}} = \boxed{\dfrac{1}{\sqrt{2}}}$