Evaluate the following limits:

$$\lim_{x \to 3} x^2+4 = 3^2+4 = 13$$

$$\lim_{x \to 2} x^3-2 = 2^3-2 = 8-2=6$$

$$\lim_{x \to -8} x+4 = -8+4 = -4$$

$$\lim_{x \to -2} x^2-10 = (-2)^2-10 = 4-10 = -6$$

$$\lim_{x \to a} 3x+10 = 3a+10$$

$$\lim_{r \to 3} 2r+9 = 2\cdot 3+9 = 15$$

$$\lim_{p \to 4} 23-p = 23-4 = 19$$

$$\lim_{t \to 3.5} 3t+2 = 3(3.5)+2 = 12.5$$

$$\lim_{t \to 2} t^2-2t+4 = 2^2-2\cdot 2+4 = 4$$

$$\lim_{x \to 0} x^3-10x^2+3x+\pi = 0^3-10\cdot 0^2+3\cdot 0+\pi = \pi$$

$$\lim_{x \to \pi} \sin(x) = \sin(\pi) = 0$$

$$\lim_{t \to \frac{\pi}{2}} \cos(t) = \cos\left(\frac{\pi}{2}\right) = 0$$

$$\lim_{r \to 0} \tan(r) = \tan(0) = 0$$

$$\lim_{t \to 0} 4t^2+\cos(t)+\sin^2(\pi\cdot t)-36\cdot t^{1/2}+4\sqrt[3]{t+1} =$$
$$= 0+\cos(0)+\sin^2(\pi\cdot 0)-36\cdot 0^{1/2}+4\sqrt[3]{0+1} = 1+4 = 5$$

$$\lim_{t \to 2} \frac{(t^2+1)(t-4)}{(t+3)(t+8)} = \frac{(2^2+1)(2-4)}{(2+3)(2+8)} = \frac{5\cdot -2}{5\cdot 10} = -\frac{1}{5}$$

Evaluate the following limits. You may need to use algebra to rewrite the function before taking the limit. Pay close attention to your notation and keep the limit notation until you finally evaluate the limit.

$$\lim_{x\to 4}\frac{(x+2)(x-4)}{(x^2-16)}$$

try it: $\dfrac{(4+2)(4-4)\to 0}{(4^2-16)\to 0}$ $\Rightarrow$ "Plug + chug" is NOT working.

Attempt # 2:

$$\lim_{x\to 4}\frac{(x+2)(x-4)}{(x^2-16)} = \lim_{x\to 4}\frac{(x+2)(x-4)}{(x+4)(x-4)} = \lim_{x\to 4}\frac{x+2}{x+4} = \frac{4+2}{4+4} = \frac{6}{8} = \frac{3}{4}$$

factor (x^2-16) Cancel $(x-4)$ terms evaluate (no more $\lim_{x\to 4}$)

$$\lim_{x\to 2}\frac{(x-2)(x+3)}{(x+10)(x-2)} = \lim_{x\to 2}\frac{x+3}{x+10} = \frac{5}{12}$$

$$\lim_{x\to 3}\frac{(x-2)(x-3)}{(x-3)(x+4)} = \lim_{x\to 3}\frac{x-2}{x+4} = \frac{1}{7}$$

$$\lim_{t\to -2}\frac{(t+2)(t+3)}{(t+4)(t+2)} = \lim_{t\to -2}\frac{t+3}{t+4} = \frac{1}{2}$$

$$\lim_{t\to 3}\frac{(t-3)(t+4)}{(t^2-9)} = \lim_{t\to 3}\frac{(t-3)(t+4)}{(t+3)(t-3)} = \lim_{t\to 3}\frac{t+4}{t+3} = \frac{7}{6}$$

$$\lim_{t\to -2}\frac{(t+2)(t-3)}{(t^2-4)} = \lim_{t\to -2}\frac{(t+2)(t-3)}{(t+2)(t-2)} = \lim_{t\to -2}\frac{t-3}{t-2} = \frac{-5}{-4} = \frac{5}{4}$$

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

$$\lim_{x\to 1}\frac{x^2+x-2}{(x^2-1)} = \lim_{x\to 1}\frac{(x-1)(x+2)}{(x-1)(x+1)} = \lim_{x\to 1}\frac{x+2}{x+1} = \frac{3}{2}$$

$$\lim_{t\to 2}\frac{(t^2-4)}{t^2+3t-10} = \lim_{t\to 2}\frac{(t+2)(t-2)}{(t-2)(t+5)} = \lim_{t\to 2}\frac{t+2}{t+5} = \frac{4}{7}$$

$$\lim_{t\to3}\frac{t^2-5t+6}{t^2+t-12} = \lim_{t\to3}\frac{(t-2)(t-3)}{(t+4)(t-3)} = \lim_{t\to3}\frac{t-2}{t+4} = \frac{1}{7}$$

$$\lim_{x\to1/2}\frac{2x^2-13x-24}{2x^2+11x+12} = \lim_{x\to1/2}\frac{(2x+3)(x-8)}{(2x+3)(x+4)} = \lim_{x\to1/2}\frac{x-8}{x+4} = \frac{\frac{-15}{2}}{\frac{7}{2}} = \frac{-15}{2}\cdot\frac{2}{7} = \frac{-15}{7}$$

$$\lim_{x\to4}\frac{x-4}{\sqrt{x}-2} = \lim_{x\to4}\frac{(x-4)(\sqrt{x}+2)}{(\sqrt{x}-2)(\sqrt{x}+2)} = \lim_{x\to4}\frac{(x-4)(\sqrt{x}+2)}{x-4} = \lim_{x\to4}\sqrt{x}+2 = \boxed{4}$$

multiply by conjugate hint: don't expand numerator cancel $x-4$

$$\lim_{x\to16}\frac{\sqrt{x}-4}{x-16} = \lim_{x\to16}\frac{\sqrt{x}-4}{x-16}\cdot\frac{\sqrt{x}+4}{\sqrt{x}+4} = \lim_{x\to16}\frac{x-16}{(x-16)(\sqrt{x}+4)} = \lim_{x\to16}\frac{1}{\sqrt{x}+4} = \frac{1}{8}$$

(Note: could also factor $x-16=(\sqrt{x}+4)(\sqrt{x}-4)$)

$$\lim_{x\to9}\frac{x^2-9x}{\sqrt{x}-3} = \lim_{x\to9}\frac{x^2-9x}{\sqrt{x}-3}\cdot\frac{\sqrt{x}+3}{\sqrt{x}+3} = \lim_{x\to9}\frac{(x^2-9x)(\sqrt{x}+3)}{x-9}$$

$$= \lim_{x\to9}\frac{x(x-9)(\sqrt{x}+3)}{x-9} = \lim_{x\to9}x(\sqrt{x}+3) = 9(\sqrt{9}+3) = 54$$

$$\lim_{x\to0}\frac{\sqrt{x^2+25}-5}{x^2} = \lim_{x\to0}\frac{\sqrt{x^2+25}-5}{x^2}\cdot\frac{\sqrt{x^2+25}+5}{\sqrt{x^2+25}+5} = \lim_{x\to0}\frac{x^2+25-25}{x^2(\sqrt{x^2+25}+5)}$$

$$= \lim_{x\to0}\frac{x^2}{x^2(\sqrt{x^2+25}+5)} = \lim_{x\to0}\frac{1}{\sqrt{x^2+25}+5} = \frac{1}{\sqrt{25}+5} = \frac{1}{10}$$

$$\lim_{t\to0}\frac{t^2}{\sqrt{t^2+9}-3}$$

$$= \lim_{t\to0}\frac{t^2}{\sqrt{t^2+9}-3}\cdot\frac{\sqrt{t^2+9}+3}{\sqrt{t^2+9}+3} = \lim_{t\to0}\frac{t^2(\sqrt{t^2+9}+3)}{t^2+9-9}$$

$$= \lim_{t\to0}\sqrt{t^2+9}+3 = 6$$