PSU LIMITS PRACTICE

$$f(x) = \frac{|x|(x-3)}{(3+x)(3-x)}$$

$$f(x) = \frac{-|x|}{3+x}$$

#1) $\frac{-|3|}{3+3} = \frac{-3}{6} = -\frac{1}{2}$

#2) $x = -3$

#3) $x = 3$ so $(3, -\frac{1}{2})$ is a hole
thus removable

#4) $\lim_{\theta \to 0} \frac{\csc(3\theta)}{\cot\theta} = \lim_{\theta \to 0} \frac{\tan\theta}{\sin(3\theta)} \cdot \frac{3\theta}{3\theta} \cdot \frac{\theta}{\theta}$

$= \lim_{\theta \to 0} \frac{\tan\theta}{\theta} \cdot \lim_{\theta \to 0} \frac{3\theta}{\sin 3\theta} \cdot \lim_{\theta \to 0} \frac{\theta}{3\theta}$

$= 1 \cdot 1 \cdot \lim_{\theta \to 0} \frac{\theta}{3\theta}$

$= 1 \cdot 1 \cdot \lim_{\theta \to 0} \frac{1}{3}$

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$\boxed{\frac{1}{3}}$

#5) $-2 + 2c = -6c + k \Rightarrow 8c - 2 = k$

$3c + k = 3 - 2k \Rightarrow c - 1 = k$

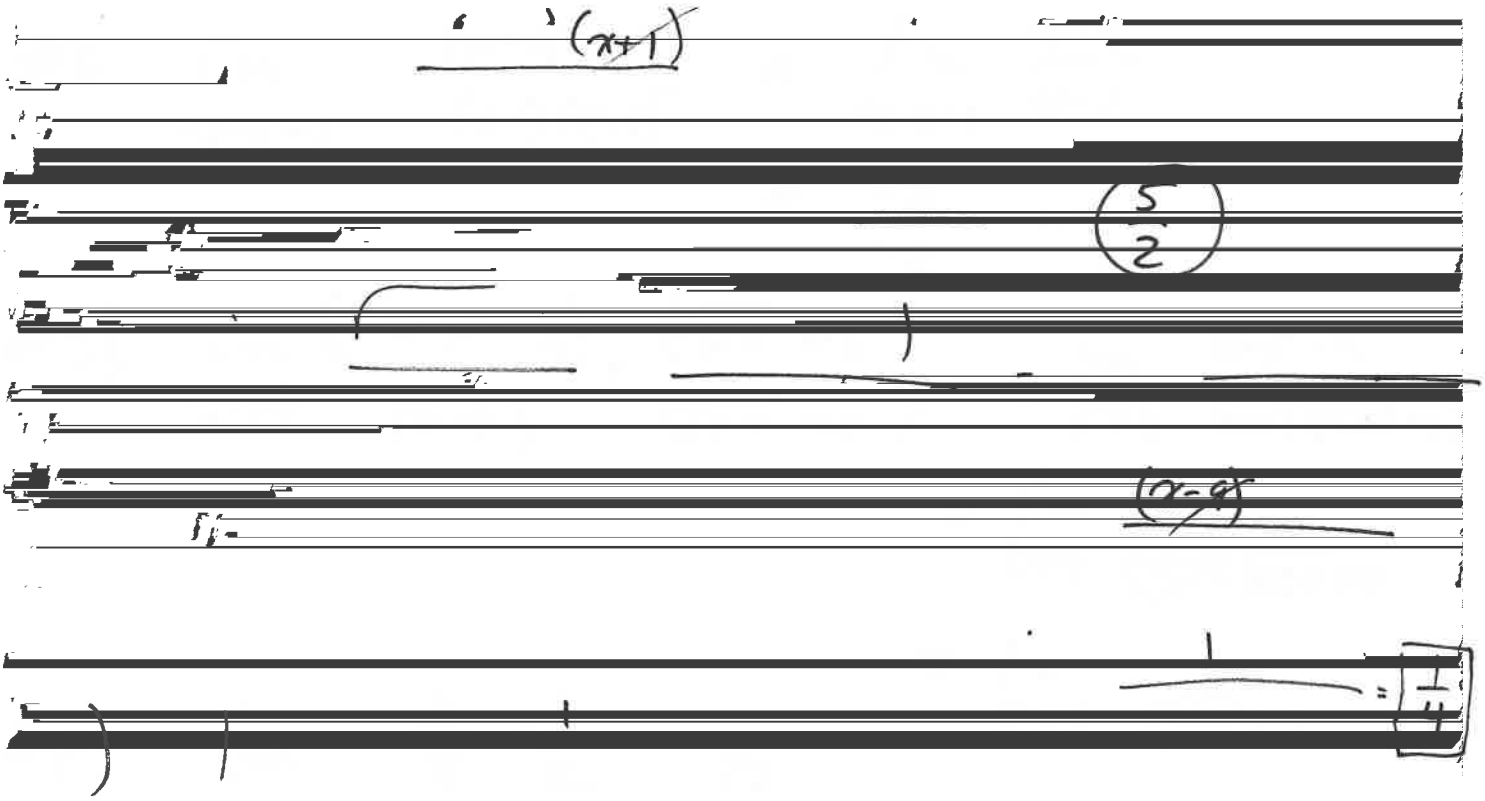
so... $8c - 2 = c - 1$

$7c - 2 = -1$

$7c = 1$

$c = 1/7$ so... $\frac{1}{7} - 1 = k$

$-\frac{6}{7} = k$



$= -5$ or -2

#7) $\lim_{x \to 9} \left(\frac{x^5 - x^2}{x(x-2) \cdot 2x} \cdot \frac{\sqrt{x-5} + 2}{(\sqrt{x-5} + 2)} \right) \cdot \frac{1}{\lim_{x \to 9} x - 5 - 4}$

$= \lim_{x \to 9} \frac{1}{(x-9)(\sqrt{x-5}+2)}$

$= \lim_{x \to 9} \frac{1}{(x-9)\sqrt{x-5}+2}$

$= \lim_{x \to 9} \frac{1}{\sqrt{x-5}+2}$

#8 $\lim_{x \to 2} \frac{\frac{1}{x} - \frac{1}{2}}{\frac{x}{1} - \frac{2}{1}} \cdot \frac{2x}{2x}$

$\lim_{x \to 2} \frac{-1}{2x} = -\frac{1}{4}$

#9) DNE DEG NUM > DEG DENOM

$(+\infty)$

#19) NO $\lim_{x \to 3^-} f(x) \neq \lim_{x \to 3^+} f(x)$

Also $f(3)$ undefined

#20) YES $\lim_{x \to -2} f(x) = 3$

$f(-2) = 3$

So... $\lim_{x \to -2} f(x) = f(-2)$

#21) $f(x) = \dfrac{1}{(2\sin x + 1)(\sin x - 1)}$

So... whenever $2\sin x + 1 = 0$ or $\sin x - 1 = 0$

$\sin x = -\frac{1}{2}$ or $\sin x = 1$

$x = \frac{7\pi}{6}, \frac{11\pi}{6}$ or $x = \frac{\pi}{2}$

Vertical asymptotes are the equations

$x = \frac{7\pi}{6}$

$x = \frac{11\pi}{6}$

$x = \frac{\pi}{2}$