Unit 3, 1/29/2021

1) $\dfrac{(x^2-5x+6)x}{x-2}$

$\lim_{x\to 2} \dfrac{(x-2)(x-3)x}{x-2}$

$\dfrac{(2-3)\cdot 2}{1} = -2$

2) $\lim_{x\to 1} \dfrac{x^5-1}{x-1}$

$\lim_{x\to 1} \dfrac{(x-1)(x^4+x^3+x^2+x+1)}{(x-1)}$

$= 1+1+1+1+1$

$= 5$

3)

a) $\lim_{x \to -1} \dfrac{x^4 - 1}{x + 1} = \dfrac{(x^2-1)(x^2+1)}{x+1} = \dfrac{(x-1)(x+1)(x^2+1)}{x+1} = -4$

b) $\lim_{x \to 0} \dfrac{\sin^2 x - 1}{\sin x - 1}$

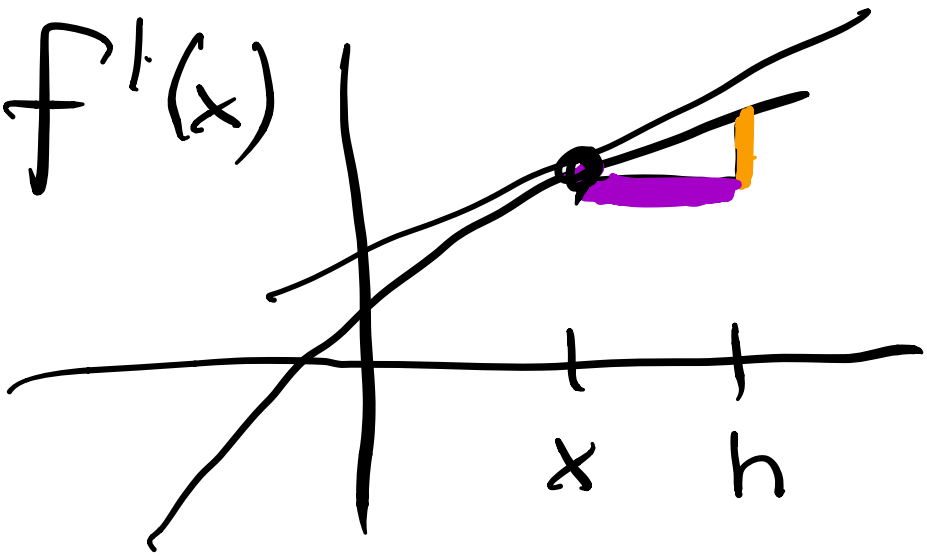
no need to heal! $x = 0$ → 1

c) $\lim_{x \to 0} \dfrac{\tan x}{\sin x} = \dfrac{\sin x}{\cos x \sin x} = \dfrac{1}{\cos x}$

$x = 0$: 1 $= \sec(x)$

$$\lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$= f'(x)$



$\longrightarrow$ Slope, velocity

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4)

a) $\lim_{x \to 0} \frac{\sin^2(x^3)}{x^6} =$

$\lim_{x \to 0} \frac{\sin(x^3)}{x^3} \cdot \frac{\sin(x^3)}{x^3}$

$= 1 \cdot 1 = 1$

b) $\lim_{x\to 0} \dfrac{5x}{\sin 7x} \cdot \dfrac{7x}{7x} = \dfrac{5}{7}$

$\dfrac{7x}{7x} \to 1$

c) $\lim_{x\to 0} \dfrac{5x\,(x^2-1)}{\sin 7x\,(x-1)}$

$\dfrac{(x^2-1)}{(x-1)} \to 1$

$= \lim_{x\to 0} \dfrac{5x}{\sin 7x}$

$\dfrac{(x-1)(x+1)}{(x-1)}$

$\dfrac{5}{7}$ $= \dfrac{5}{7}$ $\to 1$

$\dfrac{5}{7}$

$\lim_{x\to 0} \dfrac{5x}{\sin 7x} \cdot \lim_{x\to 0} \dfrac{x^2-1}{x-1} = 1$

no problem at $x=0$