Feb. 17, 2017

Warmup:

$$\lim_{x \to 3} \frac{2x^3 - 7x^2 - 3x + 18}{4x^2 - 13x + 3}$$ A B

A $f(3) = 0$ $(x-3)$ is a factor

$$\begin{array}{r|rrrr} 3 & 2 & -7 & -3 & 18 \\ & & 6 & -3 & -18 \\ \hline & 2 & -1 & -6 & 0 \end{array}$$

$(x-3)(2x^2 - x - 6)$

m: -12
a: -1

$(x-3)[2x^2-4x+3x-6]$

$(x-3)[2x(x-2)+3(x-2)]$

A $\boxed{(x-3)(x-2)(2x+3)}$

B $4x^2-13x+3$ m: 12   a: -13 $-12, -1$

$= 4x^2-12x-x+3$

$= 4x(x-3)-1(x-3)$

$= \boxed{(x-3)(4x-1)}$

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

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

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

$$= \frac{1(9)}{11} = \boxed{\frac{9}{11}}$$

Difficult Questions

Ex. 1: Find the equation to the tangent of $f(x) = \frac{3}{x}$ at $x = 2$.

slope $= f'(2)$

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

$$= \lim_{h \to 0} \frac{\frac{3}{x+h} - \frac{3}{x}}{h}$$

$$= \lim_{h \to 0} \frac{\frac{\cancel{3x} - \cancel{3x} - 3h}{x(x+h)}}{h}$$

$$= \lim_{h \to 0} \frac{-3\cancel{h}}{x(x+h)\cancel{h}}$$

$$= \lim_{h \to 0} \frac{-3}{x(x+h)}$$

$$\boxed{f'(x) = \frac{-3}{x^2}}$$

$$m = f'(2) = \frac{-3}{(2)^2} = \boxed{-\frac{3}{4}}$$

$$y = mx + b$$

$$y = -\frac{3}{4}x + b$$

$$y = f(2) = \frac{3}{(2)} = \boxed{\frac{3}{2}}$$

$m = -\frac{3}{4}$

point $(2, 3/2)$

$y = mx + b$

$3/2 = -3/4(2) + b$

$3/2 = -3/2 + b$

$\boxed{b = 3}$ $\boxed{y = -3/4x + 3}$

Ex.2 : If $f(x) = x\sqrt{x-2}$, find $f'(x)$

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

$$= \lim_{h \to 0} \frac{(x+h)\sqrt{x+h-2} - x\sqrt{x-2}}{h}$$

$$= \lim_{h \to 0} \frac{(x+h)^2(x+h-2) - x^2(x-2)}{h\,[(x+h)\sqrt{x+h-2} + x\sqrt{x-2}\,)}$$

$$= \lim_{h \to 0} \frac{(x^2+2xh+h^2)(x+h-2) - x^3}{h[(x+h)\sqrt{x+h-2} + x\sqrt{}}$$

$$= \lim_{h \to 0} \frac{\cancel{x^3} + x^2h - \cancel{2x^2} + 2x^2h + 2}{h[(x+h)\sqrt{x+h-2} + x\sqrt{}}$$

$$= \lim_{h \to 0} \frac{3x^2h + 3xh^2 - 4xh + h^3}{h\,[(x+h)\sqrt{x+h-2} + x\sqrt{x}}$$

$$= \lim_{h \to 0} \frac{3x^2 + 3xh - 4x + h^2 -}{(x+h)\sqrt{x+h-2} + x\sqrt{x-2}}$$

$$= \frac{3x^2 - 4x}{x\sqrt{x-2} + x\sqrt{x-2}} = \frac{3x^2 -}{2x\sqrt{x-}}$$

$$\cdot\frac{(x+h)\sqrt{x+h-2}+x\sqrt{x-2}}{(x+h)\sqrt{x+h-2}+x\sqrt{x-2}}$$

$$\frac{+2x^2}{x-2\,]}$$

$$\frac{xh^2-4xh+xh^2+h^3-2h^2-\cancel{x^3}+\cancel{2x^2}}{x-2\,]}$$

$$\frac{-2h^2}{-2}$$

$$\frac{2h}{}$$

$$\frac{4x}{2} \quad = \boxed{\frac{3x-4}{2\sqrt{x-2}}}$$