Find the limit mentally $f(x+h) - f(x)$

$$\lim_{\Delta x \to 0} \frac{3(x+\Delta x)^5 - 2(x+\Delta x)^3 - 2(x+\Delta x) - 3x^5 + 2x^3 + 2x}{\Delta x}$$

$f(x)$

$$= \frac{d}{dx}\left(3x^5 - 2x^3 - 2x\right)$$

$f(x+h) - f(x)$

$-(3x^5 - 2x^3 - 2x)$

$$\boxed{15x^4 - 6x^2 - 2}$$

Warning!

$$\frac{d}{dx} 3^x \neq x \cdot 3^{x-1}$$

Not a power rule problem

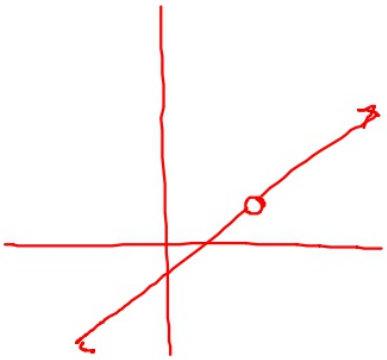
$$y = \frac{2x^2 - 3x + 5}{3x - 1} \neq \frac{4x - 3}{3}$$

not so easy !!

$$y = \frac{x^2 - 5x + 6}{x - 3} \qquad \{\mathbb{R} \mid x \neq 3\}$$

$$y = \frac{(x-3)(x-2)}{x-3}$$

$$y = x - 2$$



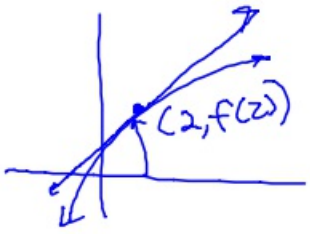
$$\frac{dy}{dx} = 1, \quad (x \neq 3)$$

"Differentiability"

Find the equation of the tangent line ($y = mx+b$ or $y - y_1 = m(x - x_1)$)

@ $x = 4$

$$f(x) = 3x^2 - 4\sqrt{x} - \frac{2}{x^2}$$



① find $f(4)$.

$3(4)^2 - 4\sqrt{4} - \frac{2}{4^2}$ $\quad (4, 39\ 7/8)$

$48 - 8 - \frac{2}{16}$ → $1/8$

$40 - \frac{1}{8}$ → $\boxed{39\ 7/8}$

② find the derivative.

$f(x) = 3x^2 - 4x^{1/2} - 2x^{-2}$

$f'(x) = 6x - 2x^{-1/2} + 4x^{-3}$] will output instant slope for given x.

③ Find slope by $f'(4)$.

$f'(4) = 6(4) - 2\left(\frac{1}{2}\right) + \frac{4}{4^3}$

$24 - 1 + \frac{4}{64}$ → $1/16$

$f'(4) = 23\frac{1}{16}$

④ Plug into point-slope slope and 11 ☺

$y - y_1 = m(x - x_1)$

$y - 39\frac{7}{8} = 23\frac{1}{16}(x - 4)$

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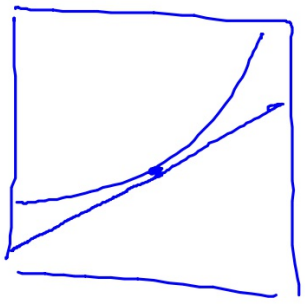
#25-33

- Skip step < [in book instructions]
- $y = mx + b$
- Do graph. [use calc.] →



- use power rule.