tangent line at x = 0 to y = (x+3)/(4x+1) +2 - Wolfram|Alpha - Windows Internet Explorer

http://www.wolframalpha.com/input/?i=tangent+line+at+x+%3D+0+to+y+%3D+%28x%2B3%29%2F%284x%2B1%29+%2B2

Favorites | tangent line at x = 0 to y = (x+3)/(4x+1) +2 - Wolf...

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tangent line at x = 0 to y = (x+3)/(4x+1) +2

Examples | Random

Input interpretation:

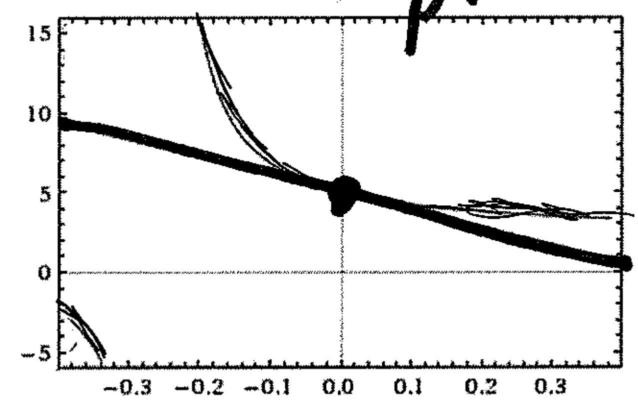
tangent line | to | $y = \frac{x+3}{4x+1} + 2$ | at | $x = 0$

Result:

$y = 5 - 11x$ ← slope $= f'(0)$

pt on line $(0, f(0))$

Plot:



Computed by Wolfram *Mathematica* | Download page

$$f(x) = \frac{x+3}{4x+1} + 2 \Big\} \leftarrow f$$

$$f'(x) = \frac{-11}{(4x+1)^2} \Big\} \leftarrow \text{derivative } f'$$

← function

2.5 Notation

$y = f(x)$

slope of tangent line to $y = f(x)$ at x is

$$\underbrace{f'(x) = y'(x) = \frac{dy}{dx}(x) = \frac{df}{dx}(x)}$$

derivative evaluated at x { all mean same thing
slope of tangent line **at x**
instaneous rate of change

$$\underbrace{f' = y' = \frac{dy}{dx} = \frac{df}{dx}}$$

functions — all mean same thing
derivative

$$\text{slope} = f'(0) = -11 = \frac{dy}{dx}$$

$$\left(= \frac{dy}{dx}(0)\right)$$

$$\frac{dy}{dx} = -11 \Rightarrow dy = -11\,dx$$

tangent line

$y = 5 - 11x$

$$\frac{dy}{dx} \neq \frac{y}{x}$$

$$\frac{\sin(y)}{\sin(x)} \neq \frac{y}{x}$$

tangent line at x = -1 to y = (x+3)/(4x+1) +2 - Wolfram|Alpha - Windows Internet Explorer

http://www.wolframalpha.com/input/?i=tangent+line+at+x+%3D+-1+to+y+%3D+%28x%2B3%29%2F%284x%2B1%29+%2B2+

Favorites | tangent li... | bittenger cal... | Calculus for ... | Inbox (7,736)... | Calculus 1 | 2[sin(2t)]^3 -... | Page | Safety | Tools

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Wolfram Alpha knowledge engine

tangent line at x = -1 to y = (x+3)/(4x+1) +2

Examples | Random

best linear approximation ~~of~~ $y=f(x)$ at $x=-1$

Input interpretation:

tangent line to $y = \frac{x+3}{4x+1} + 2$ at $\underline{x = -1}$

Result:

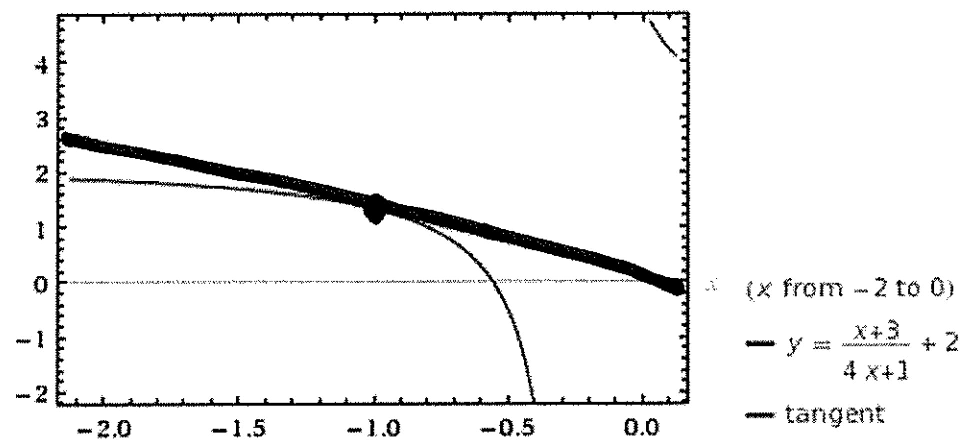
$y = \frac{1}{9} - \frac{11x}{9}$

Approximate form

slope $= f'(-1)$

pt on line $(-1, f(-1))$

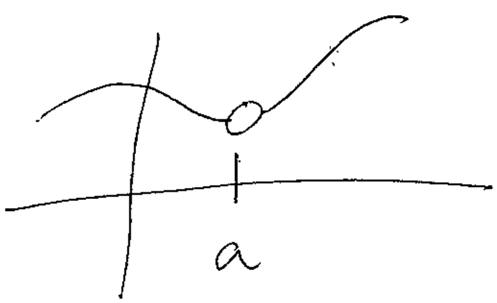
Plot:



to approximate $f(-1.001)$, can use tangent line to f at $x=-1$

2.4: When is a function <u>NOT</u> differentiable at a

Ex: $f(a)$ is not defined

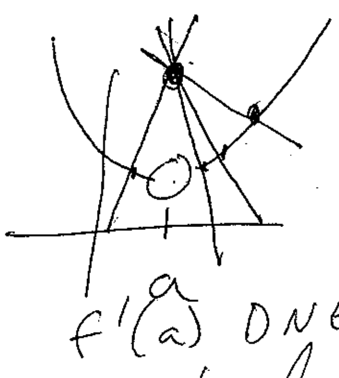


$$f'(a) = \lim_{h \to 0} \frac{f(a+h) - f(a)}{h}$$

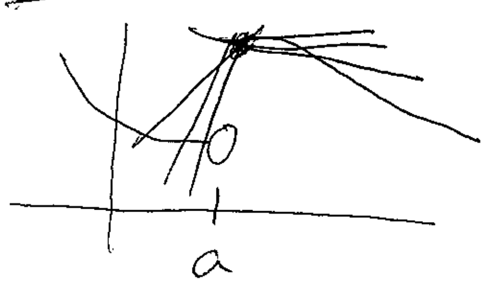
not defined
limit DNE

Not diff at a

Ex: f is <u>not continous</u> at a



$f'(a)$ DNE



$f'(a)$ DNE

tangent lines can <u>not</u> be vertical (no ∞ slope)

EX: sharp corners or cusps

f'(a) DNE

derivative DNE at a

2.5: formulas for finding derivative

$$\underbrace{\frac{d}{dx}\left(x^n\right)}_{\substack{f(x)=x^n \\ \text{Find } f'(x) \\ y=x^n \\ \text{Find } y'}} = \lim_{h\to 0} \frac{(x+h)^n - x^n}{h} = n x^{n-1}$$

↑ skip lots of steps

works for all real #'s not just positive integers

If n is an integer

$$\frac{(x+h)^n - x^n}{h} = \frac{\cancel{x^n} + n x^{n-1} h + \dots + h^n - \cancel{x^n}}{h}$$

Ex: $f(x) = x^{0.7}$

$$f'(x) = 0.7\,x^{0.7-1}$$

$$= \boxed{0.7\,x^{-0.3}}$$

Ex $\left(x^{\pi}\right)' = \pi x^{\pi - 1}$

$$\frac{d}{dx}(\sin x) = \lim_{h \to 0}\left[\frac{\sin(x+h) - \sin x}{h}\right]$$

$$= \cos(x)$$

skip steps

$$\frac{d}{dx}(\cos x) = -\sin x$$

$$\frac{d}{dx}\left(c\,f(x)\right) = \lim_{h \to 0} \frac{c f(x+h) - c f(x)}{h}$$

constant

$$= c\left[\lim_{h \to 0} \frac{f(x+h) - f(x)}{h}\right]$$

$$= c\, f'(x)$$

Ex: $[5x^2]' = 5(x^2)'$

$$= 5(2x)$$

$$= 10x$$

Ex $(f+g)' = f' + g'$