MA121-003

Wednesday, September 19

DEF. OF DERIV:

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

* find the eq. of the tangent line:

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

from last class:

(1) $f(x) = 5x^2 - 3x + 1$

$f'(x) = m_{TAN} = 10x - 3$

(2) $f(x) = \frac{8}{2x+5}$

$f'(x) = \frac{-16}{(2x+5)^2}$

1.5:

$f(x) = a \cdot x^{k}$ polynomial

$f'(x) = a(k \cdot x^{k-1})$ * (k is non-neg. integer)

{ power rule
or
exponent rule

sum / difference rule:

$y = f(x) \pm g(x)$

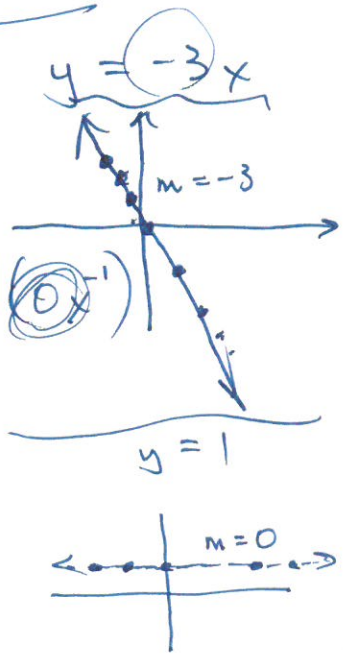
$y' = f'(x) \pm g'(x) = m_{TAN}$

$f(x) = 5x^2 - 3x^1 + 1x^0$

$f'(x) = 5 \cdot (2 \cdot x^{2-1}) - 3 \cdot (1 \cdot x^{1-1}) + 1(0x^{-1})$

$f'(x) = 10x - 3 + 0$

$f'(x) = 10x - 3$



$$f(x) = a \cdot x^k$$
$$f'(x) = a\left(k \cdot x^{k-1}\right)$$

ex: $f(x) = 13 \cdot x^{2/3}$ $\quad f(0) = 0$

$$f'(x) = 13 \cdot \left(\frac{2}{3} \cdot x^{\frac{2}{3}-1}\right)$$

$$f'(x) = \frac{26}{3} x^{-1/3} = \frac{26}{3 \cdot x^{1/3}} = \frac{26}{3 \cdot \sqrt[3]{x}}$$

$f'(0) =$ D.N.E.

↑ MTAN @ $x = 0$

D.N.E.

(VERTICAL TANGENT LINE THERE)

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ex: $g(x) = \frac{11}{7} \cdot x^{-3}$

$$g'(x) = \left(\frac{11}{7} \cdot \left(-3 \cdot x^{-4}\right)\right) = \frac{-33}{7} \cdot x^{-4}$$

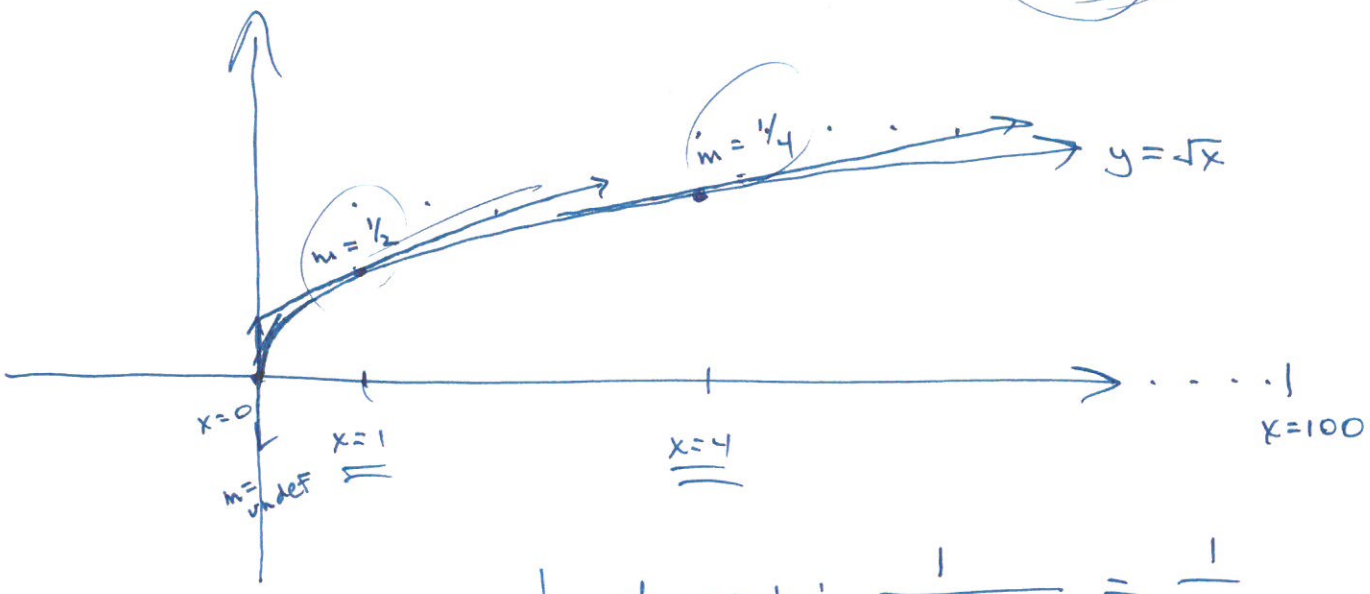
$$g'(x) = \frac{-33}{7 \cdot x^4} = \frac{\text{NEG}}{\text{POS}} = \text{NEG}$$

MTAN = NEG

$g(x)$ is DECR.

$y = \sqrt{x}$ rewrite: $y = x^{1/2}$

$y' = m_{TAN} = \frac{1}{2} \cdot x^{-1/2} = \frac{1}{2\sqrt{x}}$



y' at $x=1$: $\frac{1}{2\sqrt{1}} = \frac{1}{2}$

y' at $x=4$: $\frac{1}{2\sqrt{4}} = \frac{1}{4}$

y' at $x=0$: $\frac{1}{2\sqrt{0}} =$ undef.

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find the equation of the tangent line to the curve at the given point:

$y = x^2 - \sqrt{x}$ $\quad m_{TAN} = y' = 2x - \frac{1}{2\sqrt{x}}$

at $(4, 14)$

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

$(4, 14)$

$y = x^2 - \sqrt{x}$

$\downarrow$

16 − 2

$y - 14 = m(x - 4)$

$y' = 2x - \frac{1}{2\sqrt{x}}$

y' at $x = 4$: $2(4) - \frac{1}{2\sqrt{4}}$

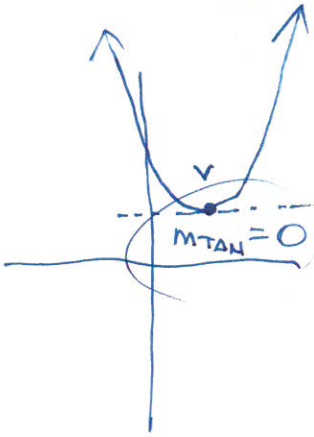
$8 - \frac{1}{4}$

$\frac{32}{4} - \frac{1}{4} = \frac{31}{4}$

$y - 14 = \frac{31}{4}(x - 4)$ * OK for TEST

$y = \frac{31}{4}(x-4) + 14$

$y = \frac{31}{4}x - \frac{31}{4}(4) + 14$



$y = ax^2 + bx + c$ parabola

$y' = a \cdot (2 \cdot x') + b + 0$

$y' = 2ax + b$

$0 = 2ax + b$ horizontal tangent line

$\frac{-b}{2a} = \frac{2ax}{2a}$

$V\left(\frac{-b}{2a}, f\left(\frac{-b}{2a}\right)\right)$

1.6:

product rule:

$f(x) = x^2$ $\neq$ $f(x) = x \cdot x$

$f'(x) = 2x$ $\neq$ $f'(x) = 1 \cdot 1 = 1$

$y = f(x) \cdot g(x)$

$y' = f(x) \cdot g'(x) + g(x) \cdot f'(x)$

ex: $y = (3x+1)(5x-4)$

prod. rule: $y' = (3x+1) \cdot 5 + (5x-4) \cdot 3$

$y' = 15x + 5 + 15x - 12$

$\boxed{y' = 30x - 7}$

check: $y = 15x^2 - 7x - 4$

$y' = 30x - 7$

$y = x^2 \qquad y' = 2x$

$y = x \cdot x \qquad y' = x(1) + x(1) = 2x$

QUOTIENT RULE:

$$y = \frac{f(x)}{g(x)} \qquad y' = \frac{g(x)\cdot f'(x) - f(x)\cdot g'(x)}{[g(x)]^2}$$

$$y = \frac{2x+3}{7x-5} \qquad y' = \frac{(7x-5)\cdot 2 - (2x+3)\cdot 7}{(7x-5)^2}$$

$$y' = \frac{14x - 10 - 14x - 21}{(7x-5)^2}$$

$$y' = \frac{-31}{(7x-5)^2} = \text{NEG}$$

$$f(x) = \frac{8}{2x+5} \qquad f'(x) = \frac{-16}{(2x+5)^2}$$

$$f'(x) = \frac{(2x+5)\cdot 0 - (8)2}{(2x+5)^2}$$

$$f'(x) = \frac{-16}{(2x+5)^2}$$

Subject: Room Change
From: Carolyn Gunton <cbgunton@ncsu.edu>
Date: 9/19/18, 10:03 AM
To: Hayley Guy <hguy@ncsu.edu>, John Griggs <jrgriggs@ncsu.edu>

On Monday, November 26 there will be a Goodnight Professorship Ceremony in SAS 2203 from 3:00-5:00. I have had to move your class for that day only.

Hayley - MA 114.003 3:00-4:15 will move to DAB 124

John - MA 121.003 4:30-5:45 will move to DAB 222

Please remind students ahead of time and the day of the room change.

Thanks and sorry for the inconvenience.....Carolyn

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