

Good afternoon: find the derivative of each function.

$$f(x) = -3x^2 - 5x - \frac{7}{4\sqrt{x^3}} + 2$$

$$-6x - 5 + \frac{21}{4}x^{-7/4} + 0$$

$$-6x - 5 + \frac{21}{4\sqrt[4]{x^7}}$$

$$y = e^6 = \cancel{6e^5} = 0$$

$$h(x) = -2\sqrt{x}$$

$$h(x) = -2x^{1/2}$$

$$h'(x) = -2 \cdot \frac{1}{2} x^{-1/2}$$

$$h'(x) = -x^{-1/2}$$

$$h'(x) = -\frac{1}{\sqrt{x}}$$

$$-7x^{-3/4}$$
$$-7 \cdot \frac{3}{4} x^{-7/4}$$

Reminders:

next assessment is ~~Monday~~

Tuesday

$$\frac{a}{x^n} \Rightarrow ax^{-n}$$

Quick check up:

Find the slope of the line tangent to $y=x^3+4x^2-3$ when $x=1$.

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

$$\frac{dy}{dx} = 3x^2 + 8x$$

$$\left. \frac{dy}{dx} \right|_{x=1} = 3(1)^2 + 8(1) = 3 + 8 = \textcircled{11}$$

$$f(x) = x^3 + 4x^2 - 3$$

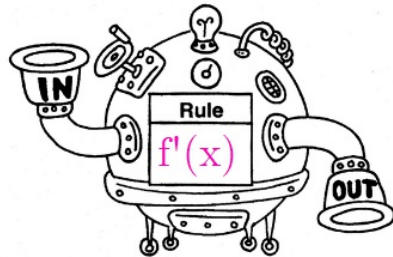
$$f'(x) = 3x^2 + 8x$$

$$f'(1) = 11$$

An important calculator notes!

Calculators cannot give you the derivative function

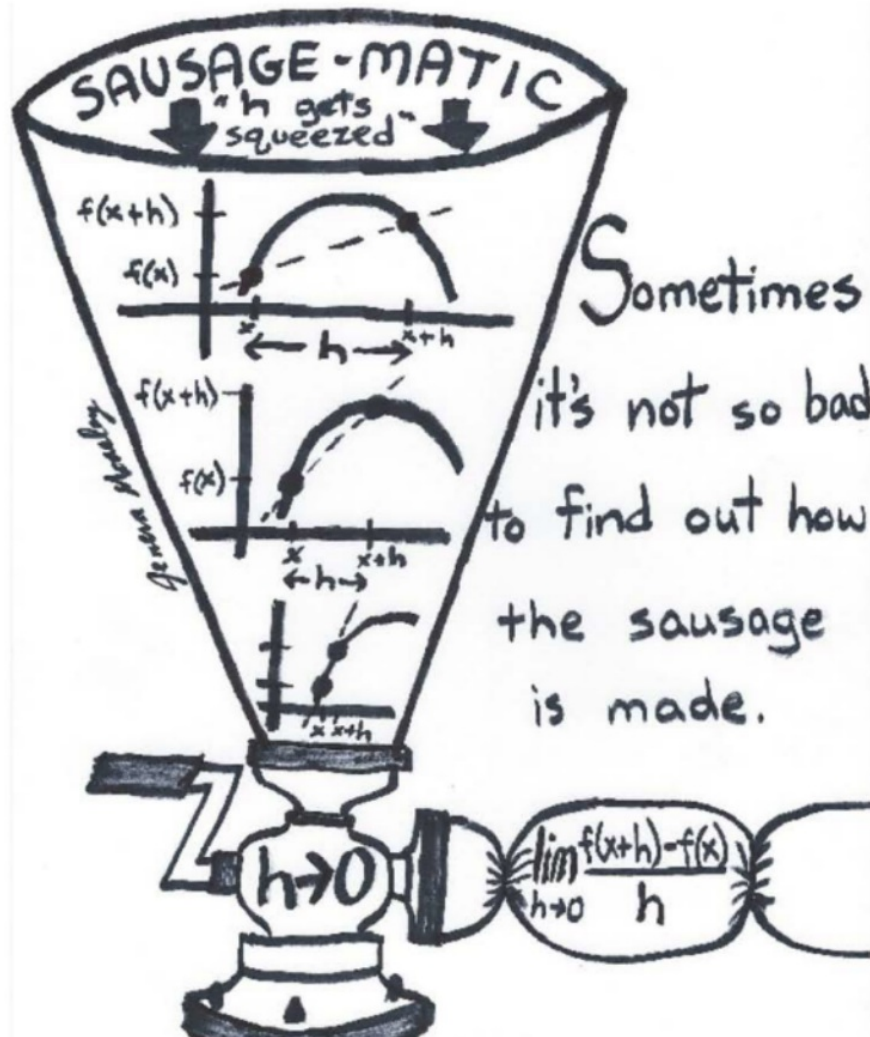
They can give you the value of derivative



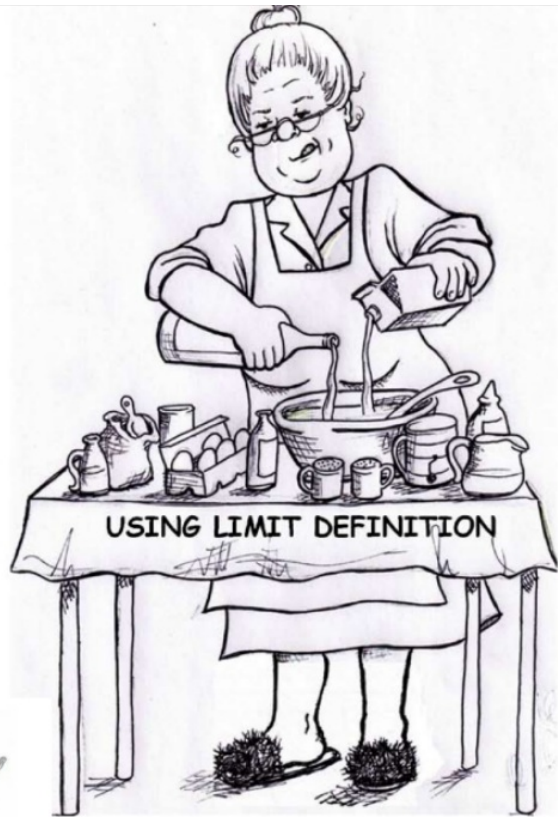
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Looking back at the 'mental images' to have

Calculus cartoons from
Dr Jeneva Moseley (UTK/Lee U)



Sometimes
it's not so bad
to find out how
the sausage
is made.

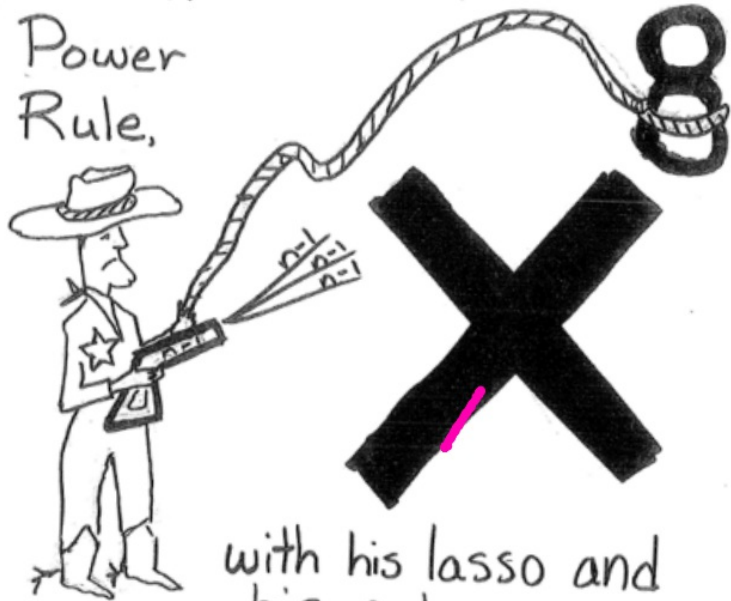


$$\lim_{\Delta x \rightarrow 0} \frac{(x + \Delta x)^n - x^n}{\Delta x}$$



$$\frac{d}{dx} x^n = nx^{n-1}$$

Sheriff
Power
Rule,

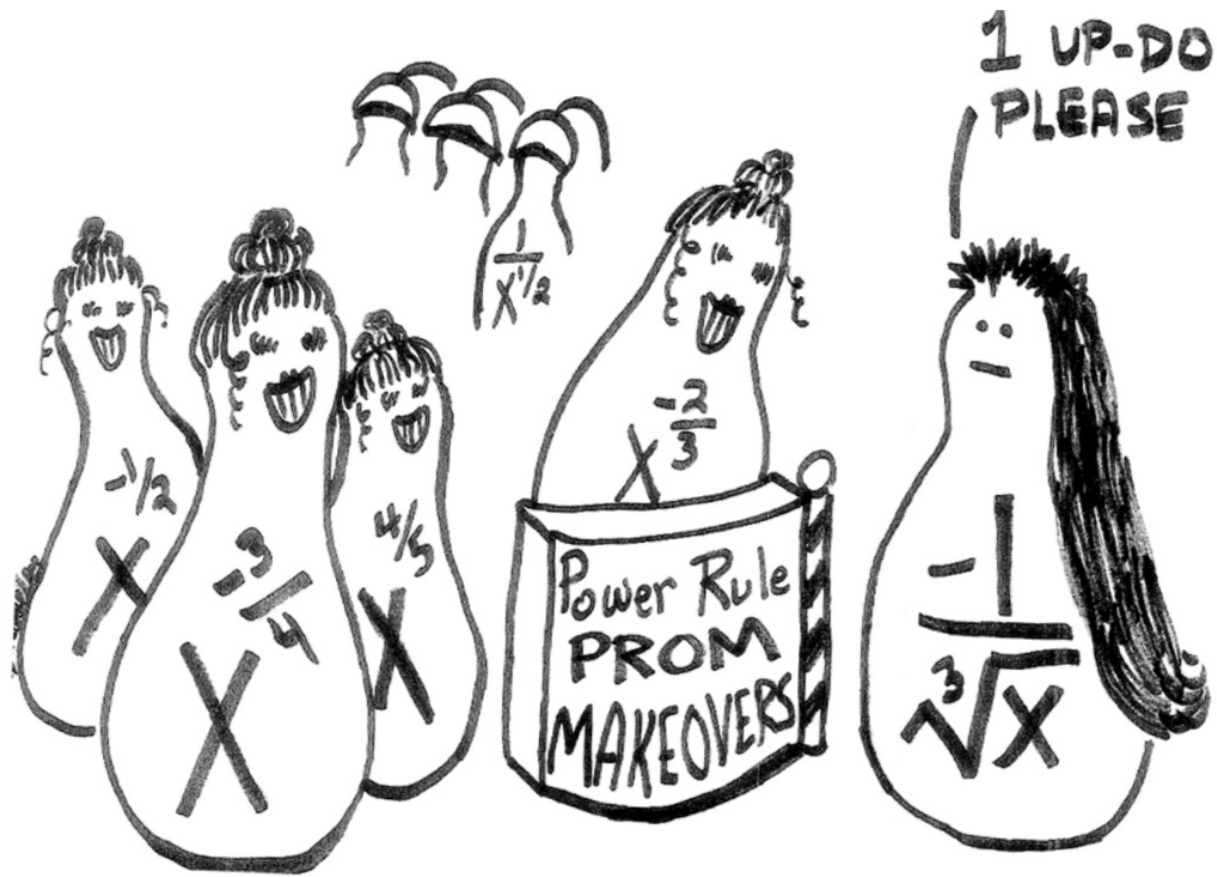


with his lasso and
his n-1 gun,

cleaning up
this town,



one derivative at a time





$$-\frac{4}{\sqrt[3]{x^2}}$$

$$-\frac{4}{x^{2/3}} \rightarrow -4x^{-2/3}$$

extreme
makeover:
MATH EDITION





$$\rightarrow -4x^{-2/3}$$

emo
edover:
EDITION



$$\underline{\underline{-4x^{-2/3}}}$$

CALCULUS \rightarrow

$$-4 \cdot \frac{-2}{3} x^{-5/3}$$

$$\downarrow$$
$$\frac{8}{3} x^{-5/3}$$

$$\frac{8}{3x^{5/3}}$$

$$\frac{8}{3\sqrt[3]{x^5}}$$

Some terminology:

derivative (as a value)

slope at a single point $\frac{dy}{dx}$ $f'(2) = 11$

derivative (as a function)

function that produces slope $\frac{dy}{dx}$
 $f'(x) = 8x^2 + 3x$

differentiation

(n.) the process
of taking a
derivative

Review:

Write the slope-intercept equation of a line passing through (3,5) and (4,-8)

Need Slope & Point.

① Slope? $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-8 - 5}{4 - 3} = -13$

② Point-Slope form

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

$m = -13$
(3,5)

$y - 5 = -13(x - 3)$

$y - 5 = -13x + 39$

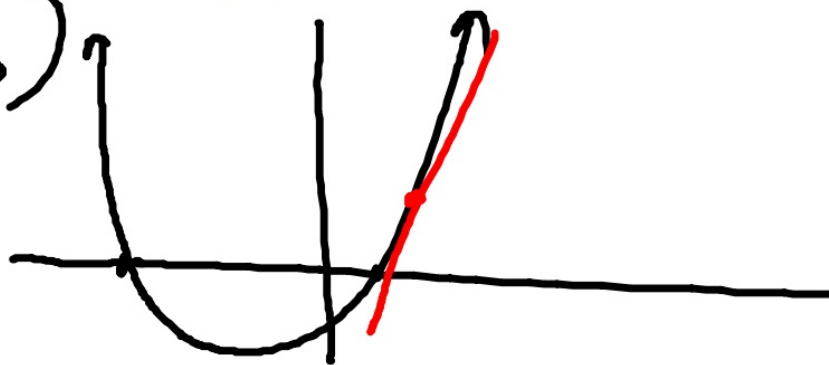
$y = -13x + 44$

Workin on my tan lines

Write the equation of the line tangent to $f(x)=3x^2+17x-6$ when $x=1$

$$f(x) = (3x - 1)(x + 6)$$

$$x = \frac{1}{3}, -6$$



Need slope & point

① Find the y-value

$$f(1) = 3(1)^2 + 17(1) - 6 = 14 \quad (1, 14)$$

② Find the slope w/ derivative

$$f'(x) = 6x + 17$$

$$f'(1) = \underline{\underline{23}} \text{ slope}$$

$$y - 14 = 23(x - 1)$$

pt. slope

Write the equation of a line tangent to $f(x) = x^2 - 3x - 5$ when $x = 2$

point: use f

$$f(2) = 2^2 - 3(2) - 5$$
$$4 - 6 - 5$$
$$-7$$

$$(2, -7)$$

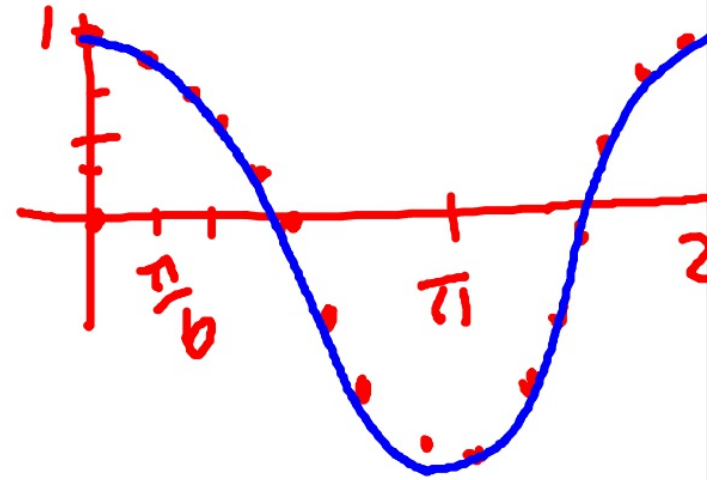
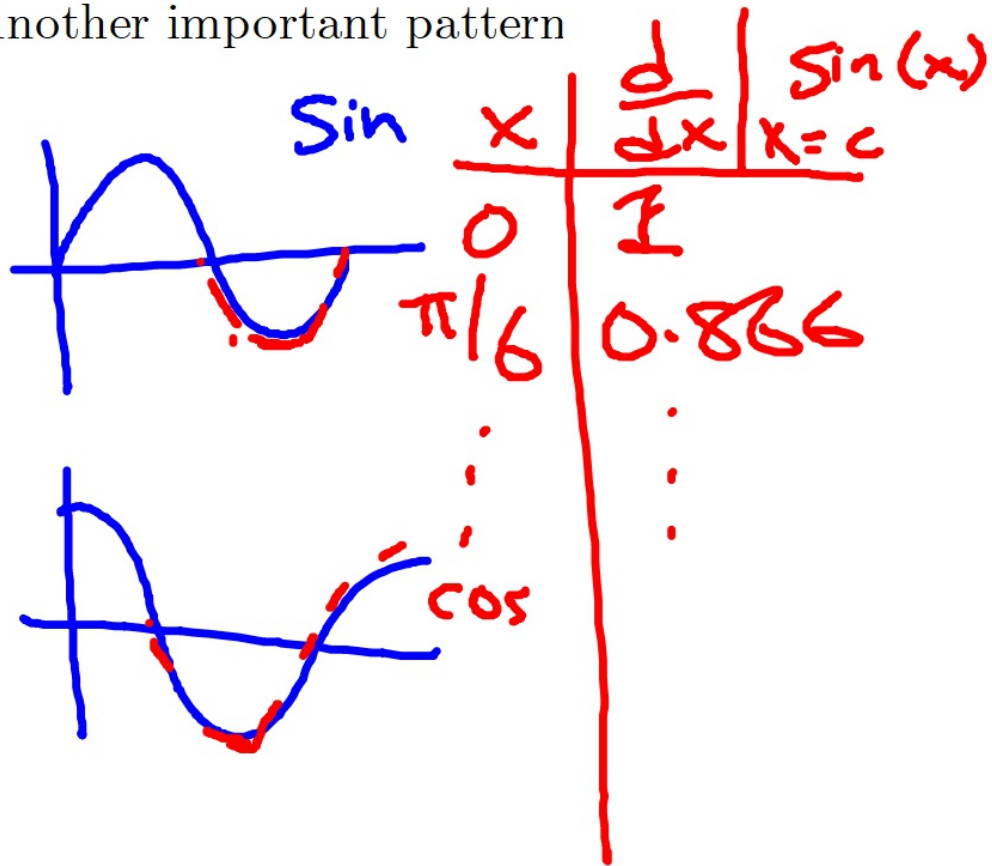
slope: use f'

$$f'(x) = 2x - 3$$

$$f'(2) = 2(2) - 3 = 1$$

$$y + 7 = 1(x - 2)$$

Another important pattern



Add to your formulas booklet:

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

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

What's on Tuesday's assessment

7 skills

- Limit definition of derivative (finding the derivative the long way, with Δx)
- Power Rule
- IVT
- Old skills: F-L1a, F-L2a, F-C3, F-B1

basic

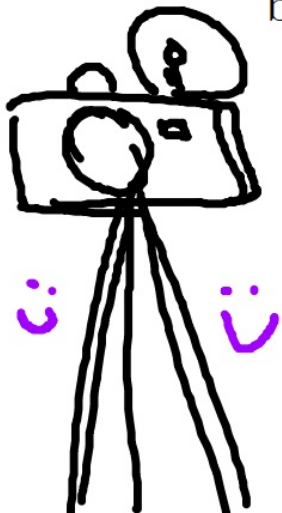
graphs

aymptotes

as limits

find/classify

disc.



HW

for Monday:

handout #1-20

for Tuesday:

practice assessment (solutions posted tomorrow)