AP Calculus: warm up in notes (write the questions)

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

1. Find y' for $y=6x^3-2x^2+\pi$

$y' = 6 \cdot 3x^2 - 2 \cdot 2x^1 + 0$

$y' = 18x^2 - 4x$

2. $y=e^6$. Find dy/dx

$y' = 0$

3. Find the limit: $\lim_{\Delta x \to 0} \frac{(x+\Delta x)^3 - 3(x+\Delta x)^4 + 2(x+\Delta x) - (x^3 - 3x^4 + 2x)}{\Delta x}$

$f(x)$

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

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

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

Another real world case

(notes)

A stone is tossed from a bridge 48 feet above the water level. Its position is modeled by $s(t)=-16t^2+32t+48$ where s is measured in feet and t in seconds

$t = 3$ sec.

- When does the rock hit the water? $s(t) = 0$

$-16t^2+32t+48=0$

$-16(t^2-2t-3)=0$

$-16(t-3)(t+1)=0$

$t=3$ $\quad$ $t=-1$

→How fast is it traveling when it hits the water?

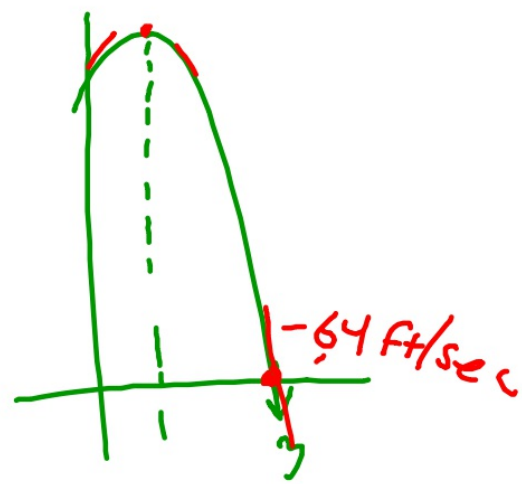
- When is the stone standing still?

$s(t)=-16t^2+32t+48$

$\frac{ft}{sec} \rightarrow \frac{ds}{dt} = -32t+32$

$\left.\frac{ds}{dt}\right|_{t=3} = -32(3)+32$

$= -64$ ft/sec



Standing Still

→ vel. $=0$

$\frac{ds}{dt} = 0 = -32t+32$

$-32 = -32t$

$1 = t$

Common Sense Derivative Properties (add to booklet)

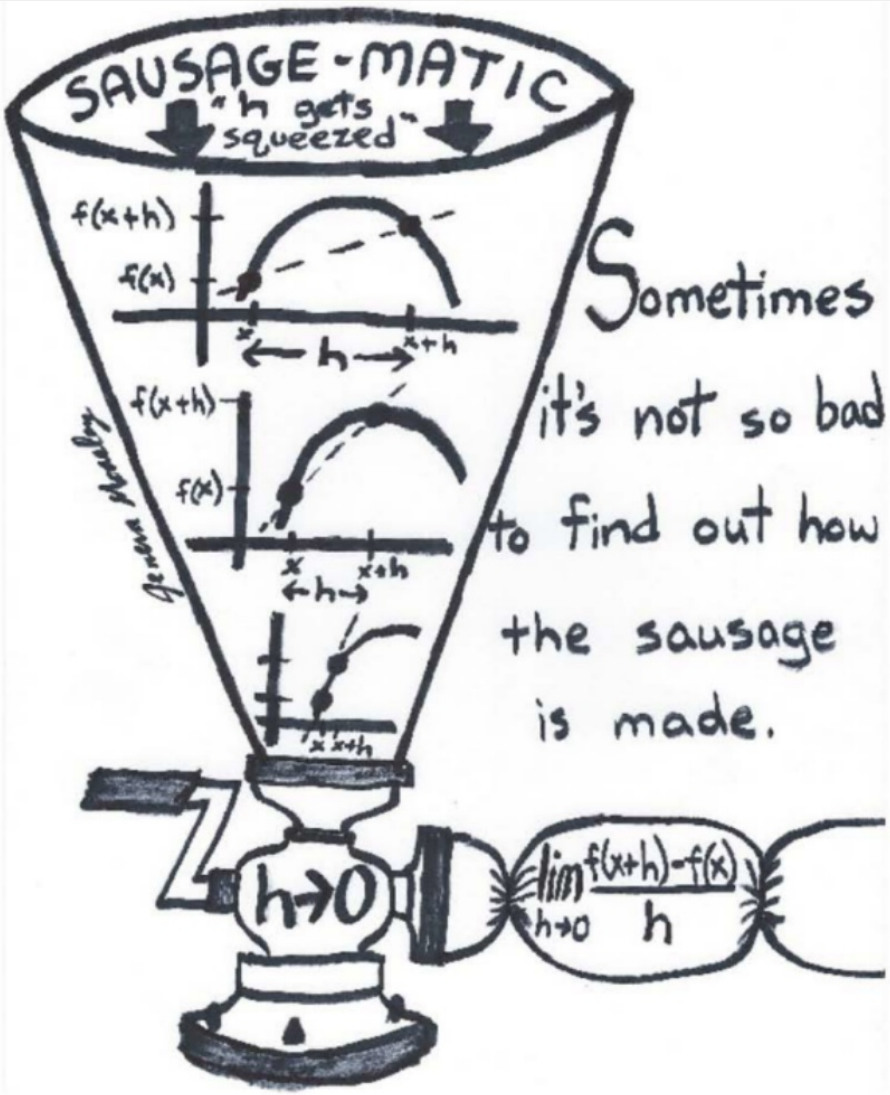
$$\frac{d}{dx}c = 0 \quad (\textit{where c is a constant})$$

$$\frac{d}{dx}cx = c \quad (\textit{where c is a constant})$$

$\frac{d}{dx}[c * f(x)] = \quad c * f'(x)$ [can "factor out" a constant]

$\frac{d}{dx}[f(x) \pm g(x)] = f'(x) \pm g'(x)$

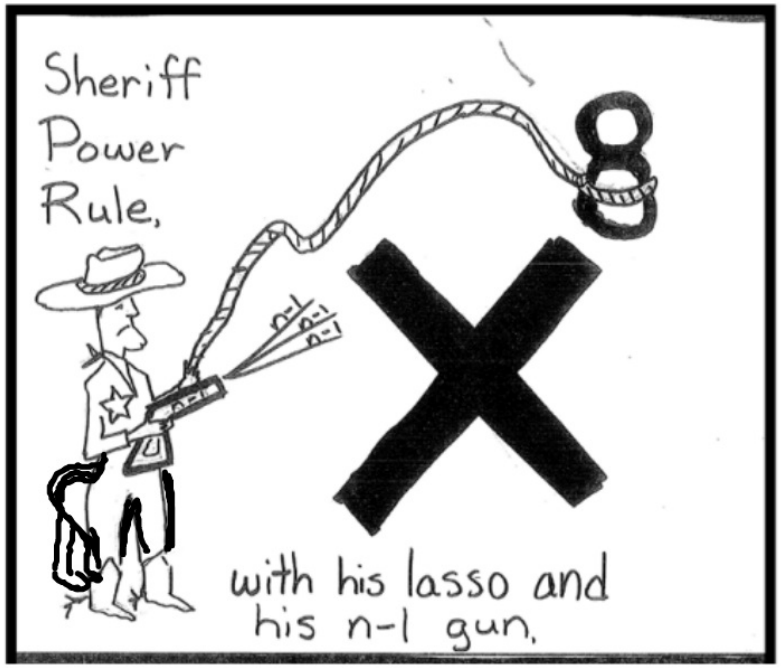
[derivative of a sum/diff is the sum/diff of derivatives]



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

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

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


Sheriff
Power
Rule,
x^8
n-1
n-1
n-1
n-1
with his lasso and
his n-1 gun.


cleaning up
this town,
$8x^7$
n-1
one derivative at a time.

To use the Power Rule a function/term must be in this form:

ax^n


$-\frac{4}{\sqrt[3]{x^2}}$
SALON
$-\frac{4}{x^{2/3}} \rightarrow -4x^{-2/3}$
extreme makeover:
MATH EDITION
$-4x^{-2/3}$
CALCULUS
$-4 \cdot \frac{8}{3}$
$\frac{8}{3x}$
$\frac{8}{3\sqrt[3]{x^3}}$

<u>Some helpful hints from Algebra II</u>

Negative Exponents $\frac{1}{x^n} \Longleftrightarrow x^{-n}$

ex $\frac{3}{x^5} = 3x^{-5}$

Fractional Exponents $\sqrt[n]{x^a} \Longleftrightarrow x^{a/n}$

ex $\sqrt[5]{x^7} = x^{7/5}$

Simplifying a rational expression

ex

$$y = \frac{x^7 - 2x + 3}{x} \Rightarrow \frac{x^7}{x} - \frac{2x}{x} + \frac{3}{x}$$

$$\Rightarrow \underbrace{x^6 - 2 + 3x^{-1}}_{\text{ready for prom}}$$

What'cha gonna do?

<u>First Derivatives Hw</u>

p. 114 #3-18, 25-30, 39-46 [D-C7]

Due Monday

<u>Reassessment!</u>

Prepping for them,

Taking them

Q1 ends Oct 6