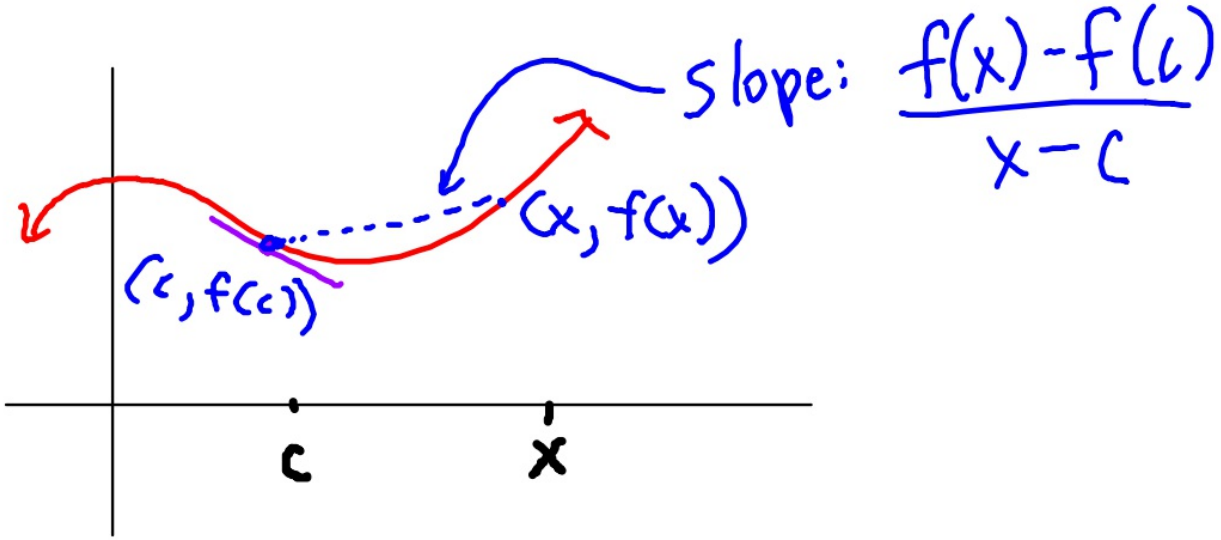
*BOOKLET*

## Alternate Form of Derivative:

Derivative of function f(x) at c is

$$f'(c) = \left.\frac{df}{dx}\right|_{x=c} = \lim_{x \to c} \frac{f(x) - f(c)}{x - c}$$



Use the alternate limit definition of derivative to redo the last example:

$f(x)= 2x^2-x+1$ at the point $(2,7)$

$$f'(2) = \lim_{x\to 2} \frac{f(x) - f(2)}{x-2}$$

$$\left.\frac{df}{dx}\right|_{x=2} = \lim_{x\to 2} \frac{2x^2-x+1-7}{x-2}$$

$$\lim_{x\to 2} \frac{2x^2-x-6}{x-2}$$

$$\lim_{x\to 2} \frac{(2x+3)(x-2)}{x-2} \Rightarrow \lim_{x\to 2} \frac{2x+3}{1} = 2(2)+3$$

$$7$$

Find the equation of the line tangent to at the point (1,-2).

$ax^n$

$$y = 3\sqrt[2]{x} - \frac{4}{x^3} + 2x^2 - 5x + 2$$

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

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

$y' = \frac{3}{2}x^{-\frac{1}{2}} + 12x^{-4} + 4x - 5$

$y' = \frac{3}{2\sqrt{x}} + \frac{12}{x^4} + 4x - 5$

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

$-2 \uparrow \quad ? \quad 1 \uparrow$

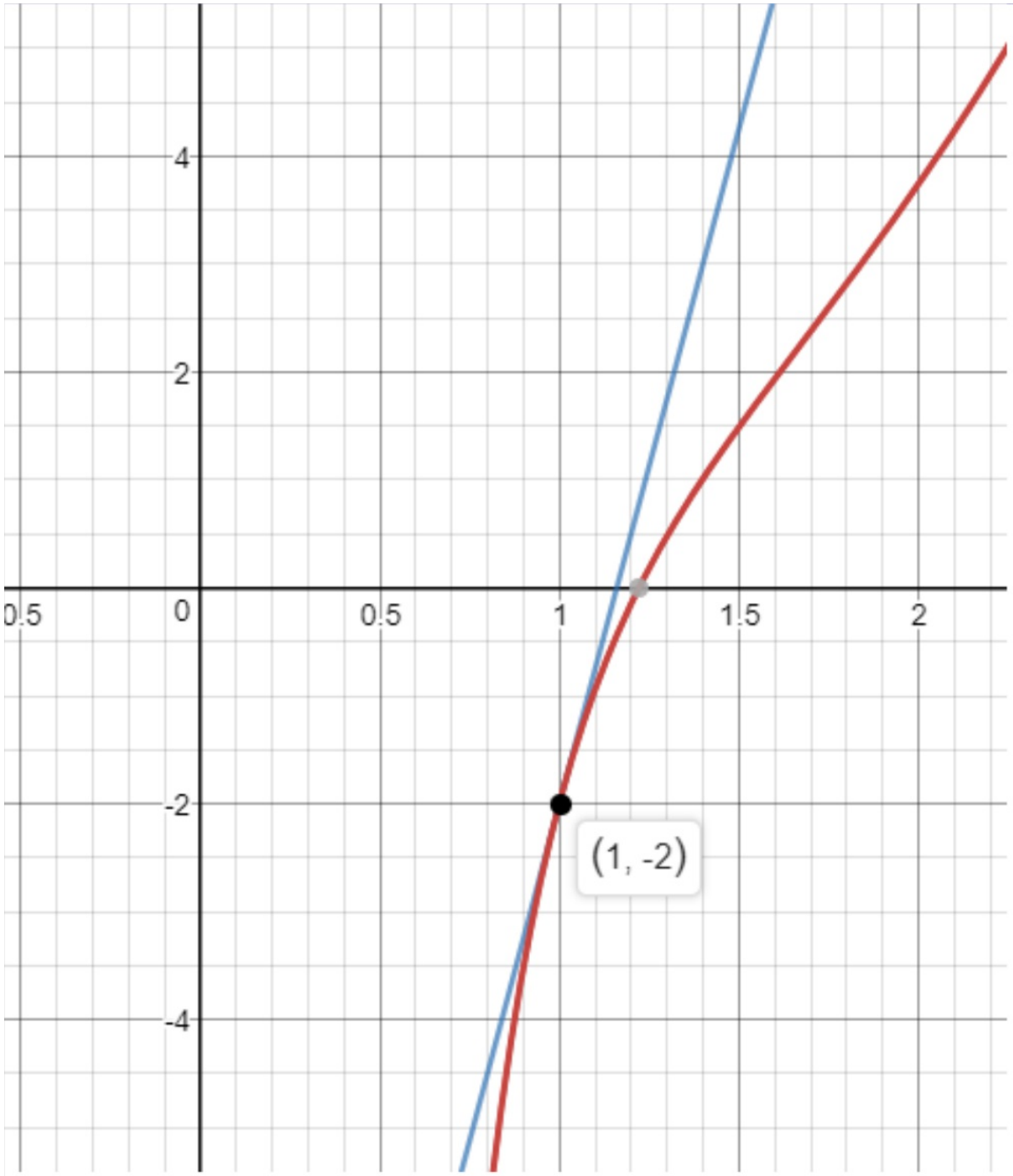
$y'(1)$:

$\frac{3}{2} + 12 + 4 - 5$

$= 12.5 = \frac{25}{2}$

$m = 12.5$

$y + 2 = 12.5(x - 1)$


4
2
0.5
0
0.5
1
1.5
2
-2
-4
(1, -2)

A nice Power Rule example:

Find $\frac{dy}{dx}$ for $y = \dfrac{2x^2 - 3\sqrt{x}}{\sqrt{x}}$

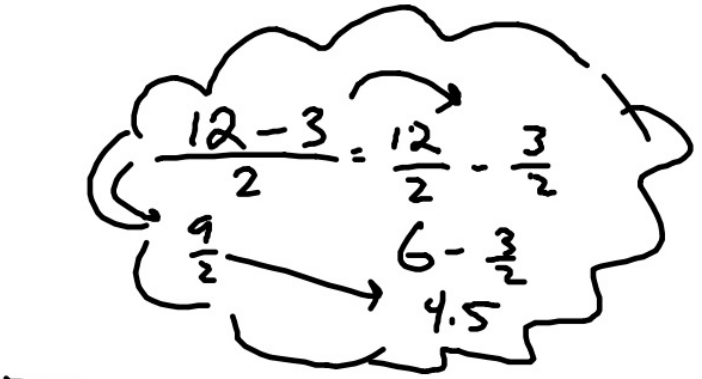
$$y = \frac{2x^2 - 3x^{\frac{1}{2}}}{x^{\frac{1}{2}}}$$

$$y = \frac{2x^2}{x^{\frac{1}{2}}} - \frac{3x^{\frac{1}{2}}}{x^{\frac{1}{2}}}$$

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

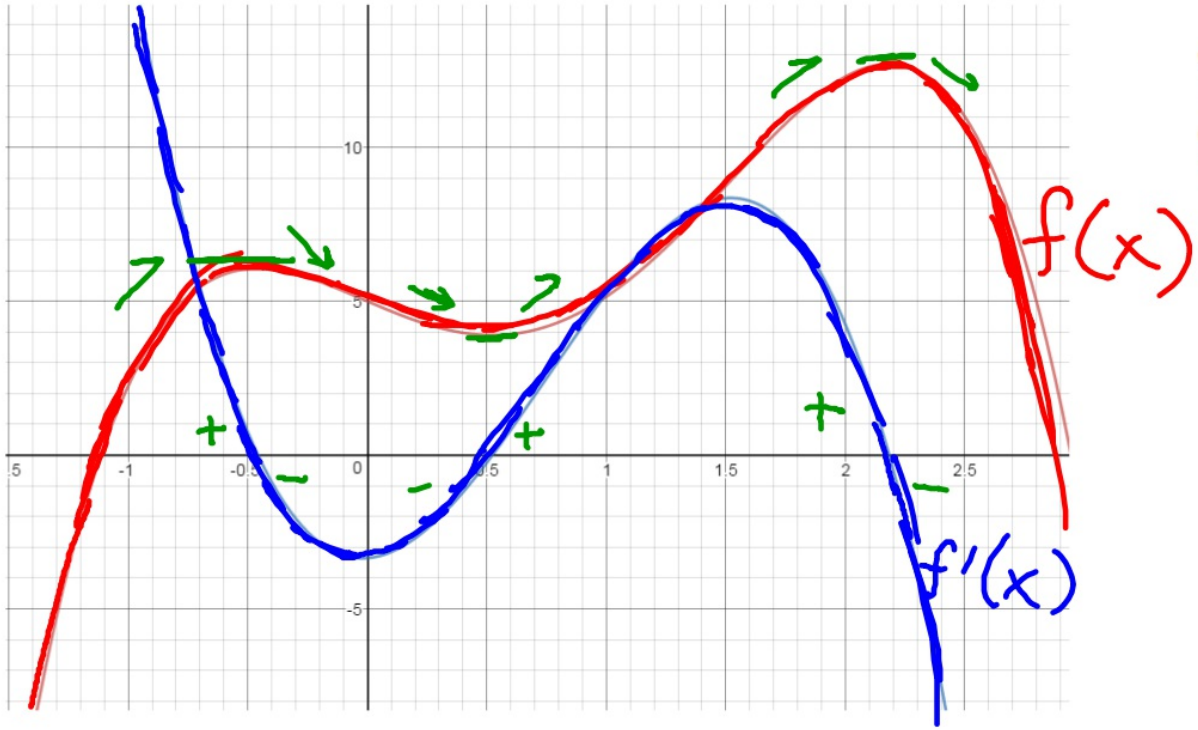
$$y' = 2 \cdot \tfrac{3}{2} x^{\frac{1}{2}} + 0$$

$$y' = 3\sqrt{x}$$

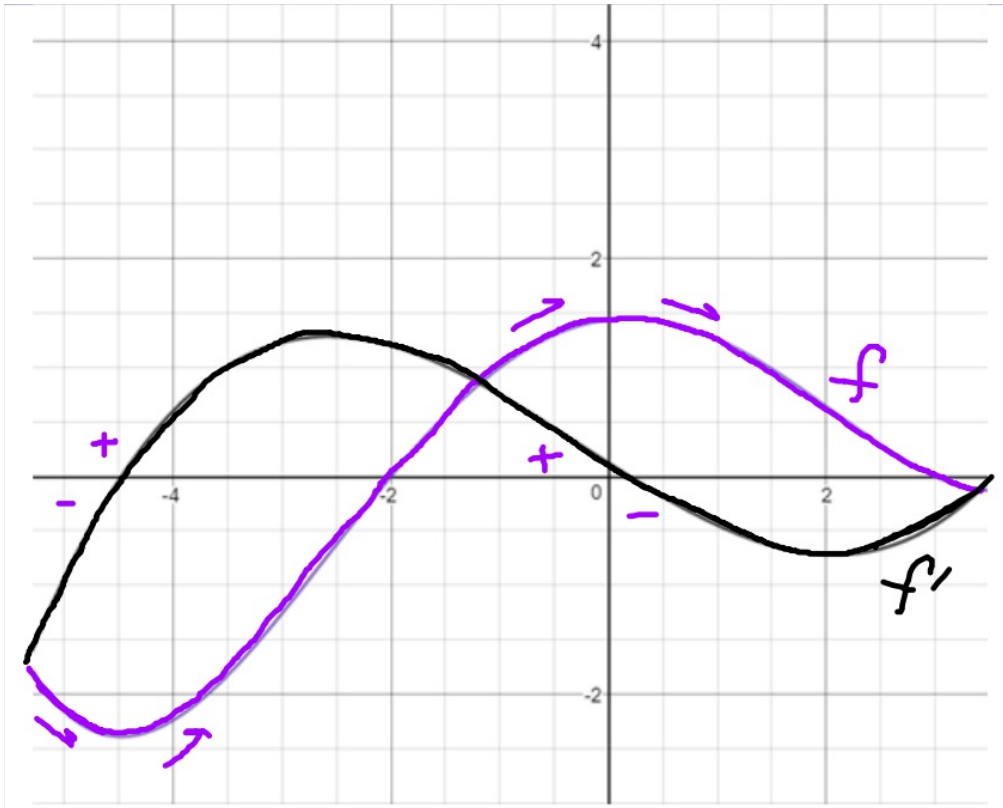



$$\frac{x^a}{x^b} = x^{a-b}$$

# Derivative as a Function



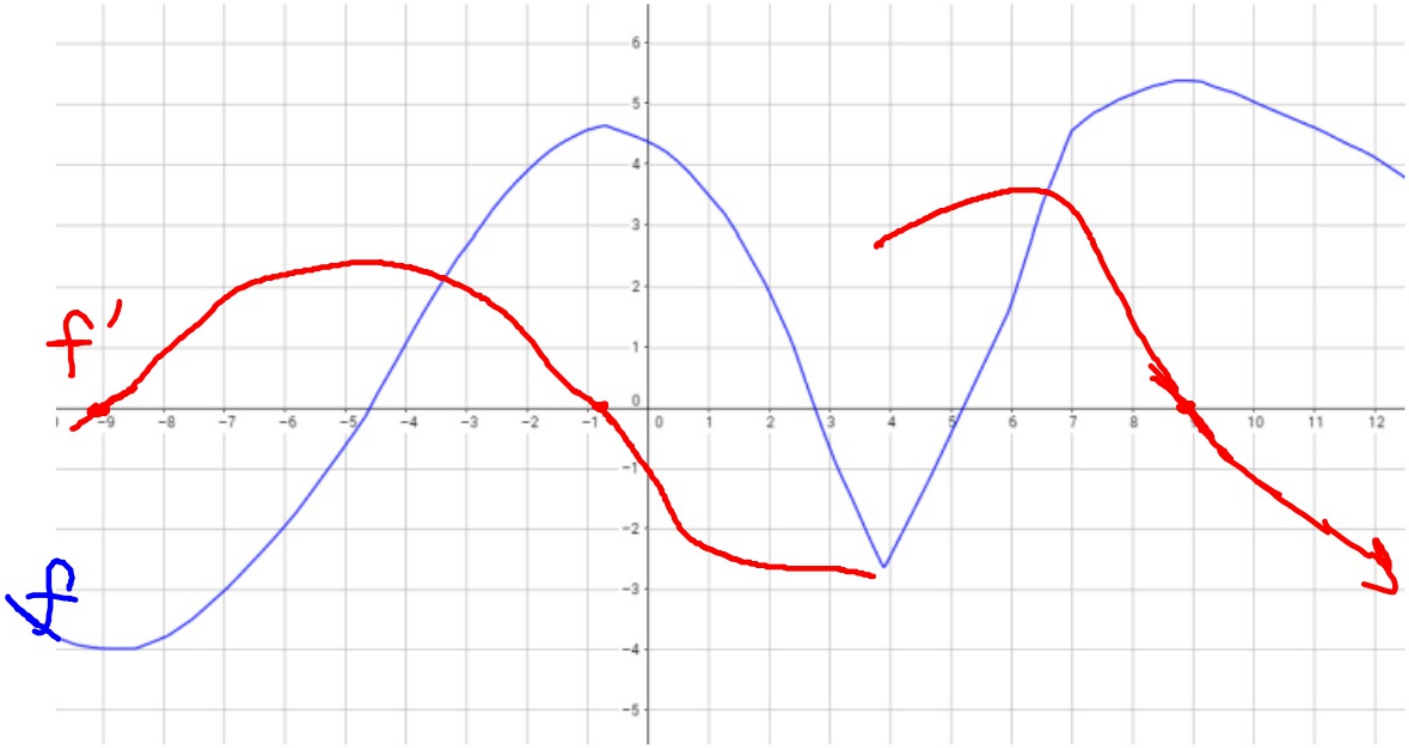

Which one is f ?
Which one is f '?




Which one is f ?

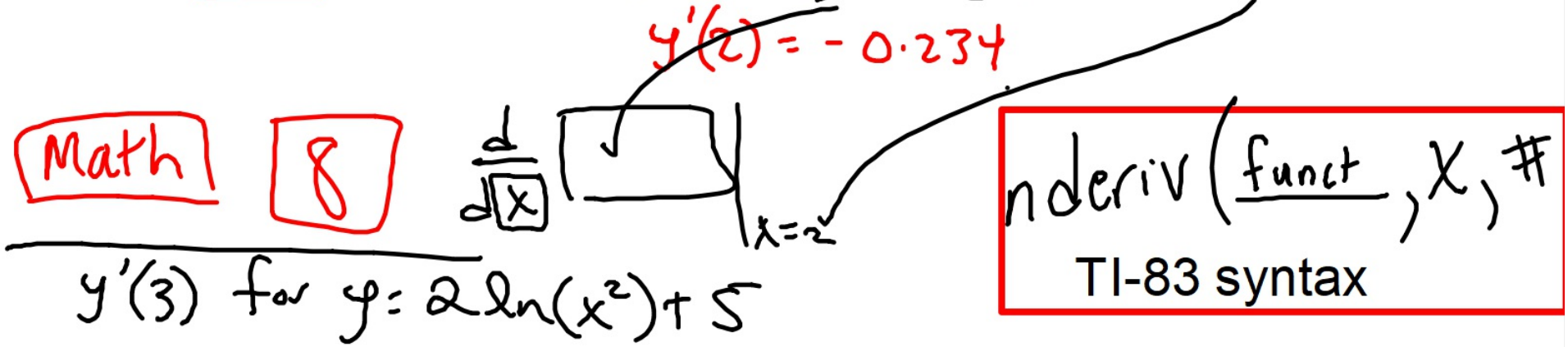
Which one is f ' ?

# Sketch the derivative function!



# How to use your TI-84 to find derivative ***value*** (not function)

Example:
find the slope of the line tangent to $y = 3x(4x-4)^{-3}$ when $x=2$




$y'(3)$ for $y = 2\ln(x^2)+5$

Adding to our derivative toolkit:

Constant functions
Linear functions
Polynomial functions
Simple Trig Functions

https://www.youtube.com/watch?v=S0_qX4VJhMQ 12:37 to 16:44

Add to booklet

$$\frac{d}{dx}\sin x = \cos x$$

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

Study tip!
All trig derivatives
starting with *c* are negative

Example:

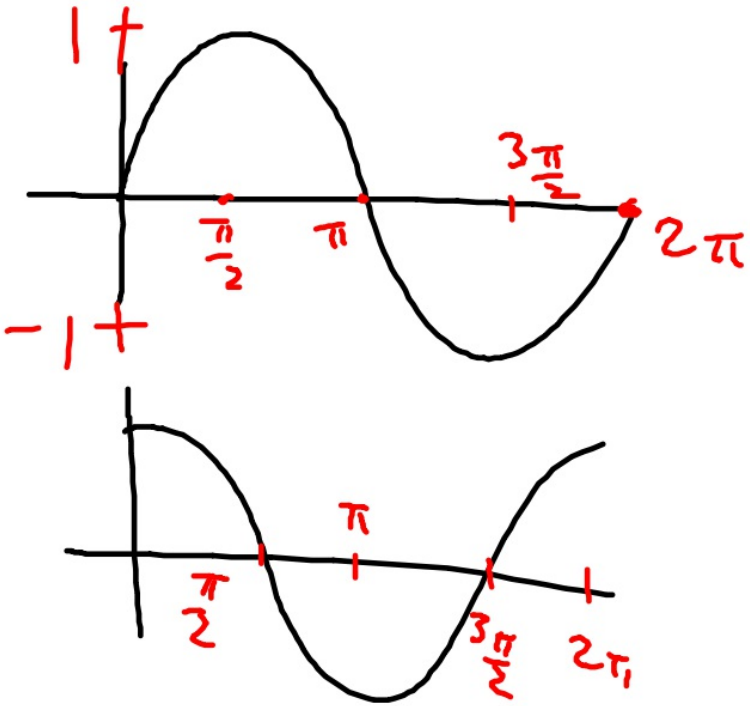
y= 2/x - cos(x) + 2  Find y'

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

$$y = 2x^{-1} - \cos(x) + 2$$

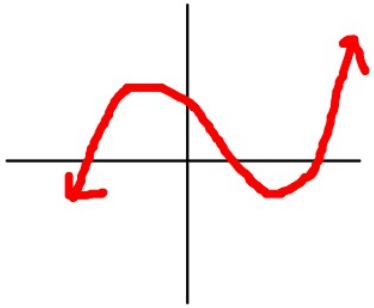
$$y' = -2x^{-2} - -\sin(x) + 0$$

$$\boxed{y' = -\frac{2}{x^2} + \sin(x)}$$

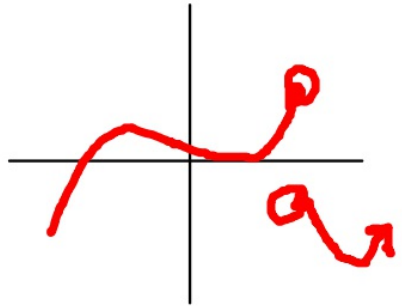


Which one doesn't belong? Be prepared to defend your selection

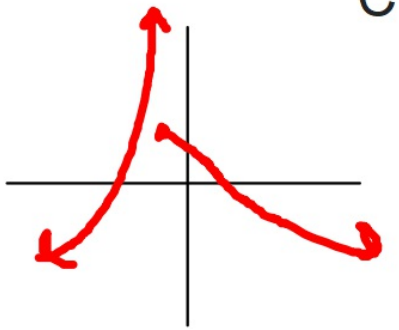
A



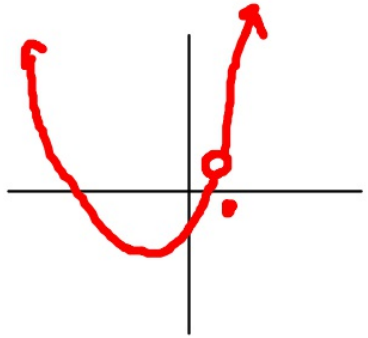
B



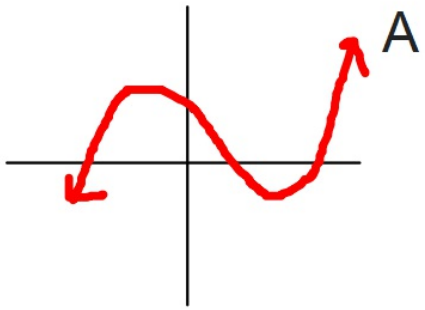
C

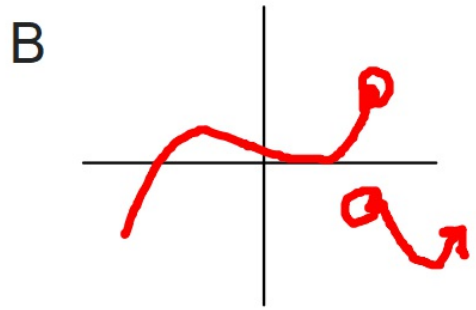


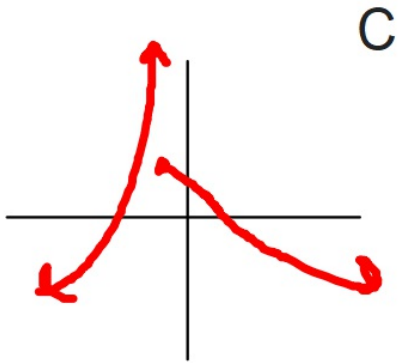
D

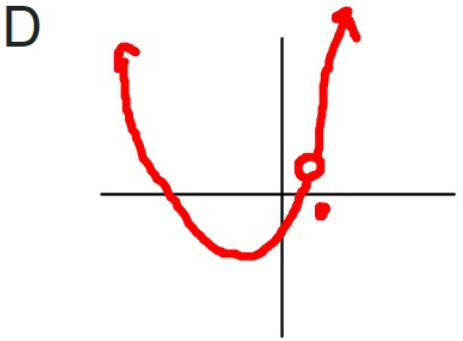


Go-around protocol: one person at a time shares reasoning until all 4 have spoken



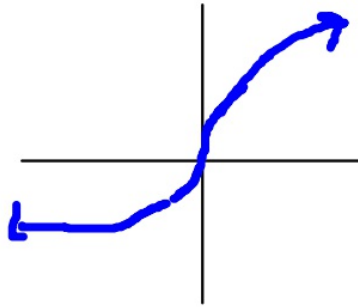



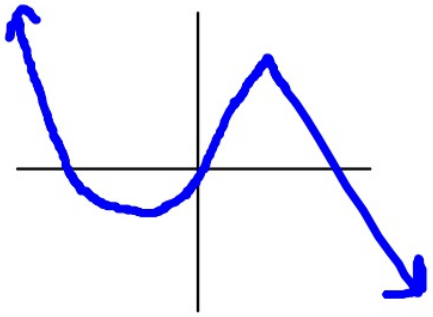



# Which one doesn't belong?

A



B



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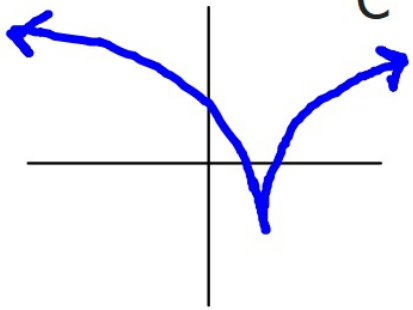

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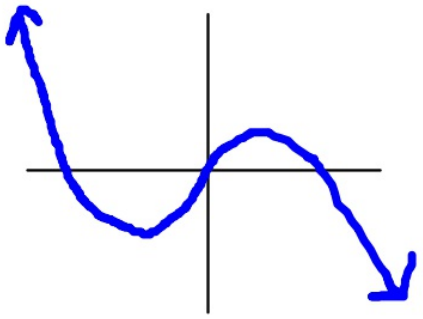

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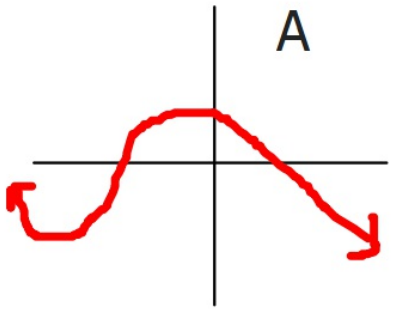

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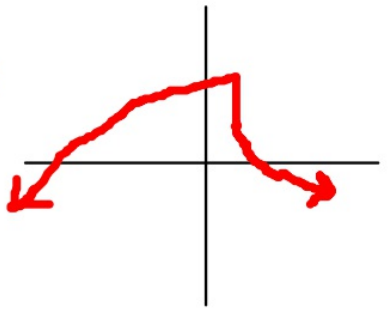

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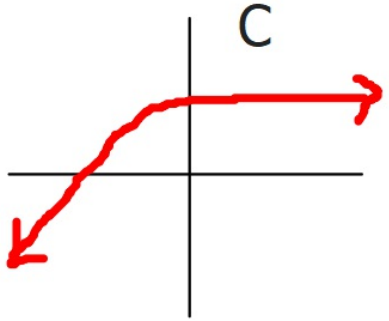

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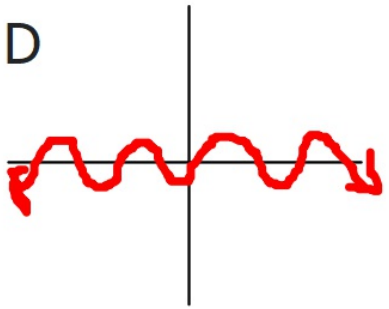

# Differentiability

HW
work on practice assessment
solutions posted to mcalc.weebly.com tonight

Assessment Friday