

$$\frac{d}{dx} e^x = e^x$$

$$\frac{d}{dx} \ln x = \frac{1}{x}$$

$$\frac{d}{dx} a^x = a^x \ln a$$

$$\frac{d}{dx} \log_a x = \frac{1}{x \ln a}$$

deriv of $x^2 3^{5x-7}$

prod rule: $x^2 \cdot 3^{5x-7} \cdot \ln 3 \cdot 5 + 3^{5x-7} \cdot 2x$

deriv of: $8 \log_2 (7x^2 - 5\sqrt{x})$

$$8 \cdot \frac{1}{(7x^2 - 5\sqrt{x}) \ln 2} \cdot (14x - 5 \cdot \frac{1}{2} x^{-1/2})$$

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Give x -values where the slope is 3 for:

$$f(x) = 2x^2 - 7x + 4$$

$$f'(x) = 4x - 7$$

$$4x - 7 = 3$$

$$4x = 10$$

$$x = 10/4 = 2.5$$

$$f(x) = 2x e^{1-3x}$$

give intervals
where it's inc/dec.

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

$$= e^{1-3x} \cdot (2x \cdot (-3) + 2)$$

$$= e^{1-3x} (-6x + 2) = 2e^{1-3x} (-3x + 1)$$

$$f' = 0: e^{1-3x} \cdot (-6x + 2) = 0$$

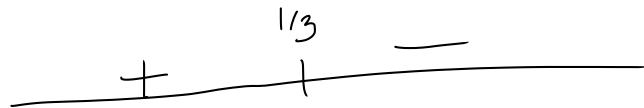
f' DNE: N/A

$$e^{1-3x} = 0 \quad \text{or} \quad -6x + 2 = 0$$

N/A

$$2 = 6x$$

$$x = 1/3$$



$$f'_{\text{cos}} = e^{1-3 \cdot 0} (-6 \cdot 0 + 2) = +$$

+ · +

$$f'(1) = e^{(-3 \cdot 1)} (-6 \cdot 1 + 2)$$

+ . -

f is increasing on $(-\infty, 1/3)$
decreasing on $(1/3, \infty)$

$$\begin{aligned} \frac{d}{dx} \left(e^{\underline{x^2(x+1)}} \right) &= \frac{d}{dx} \left(e^{\underline{x^2(x+1)^{1/2}}} \right) \\ &= e^{x^2(x+1)^{1/2}} \cdot \frac{d}{dx} \left(x^2 \cdot (x+1)^{1/2} \right) \\ &= e^{x^2(x+1)^{1/2}} \cdot \left(x^2 \cdot \frac{1}{2}(x+1)^{-1/2} \cdot 1 + (x+1)^{1/2} \cdot 2x \right) \end{aligned}$$

For $f(x) = \sqrt{7x^2 + 5/x - 8x^{10}}$,

find $f'(2)$.

first do $f'(x)$, then plug in $x=2$.

$$f(x) = (7x^2 + 5/x - 8x^{10})^{1/2}$$

\uparrow
 $5x^{-1} \rightarrow -5x^{-2}$

$$f'(x) = \frac{1}{2} (7x^2 + 5/x - 8x^{10})^{-1/2} \cdot (14x - 5x^{-2} - 80x^9)$$

$$\text{so } f'(2) = \frac{1}{2} (7 \cdot 2^2 + 5/2 - 8 \cdot 2^{10})^{-1/2} \cdot (14 \cdot 2 - 5 \cdot 2^{-2} - 80 \cdot 2^9)$$

$$\log_5 25 = ?$$

$$\text{means } 5^? = 25$$

$$\text{so } \log_5 25 = 2$$

$$\log 50 = ?$$

$$10^? = 50$$

can't do by hand.

$$\log_5 \frac{1}{125} = ?$$

$$5^? = \frac{1}{125} \quad ? = -3$$

$$\log_5 \frac{1}{125} = -3.$$

$5^x = 100$ solve for x in terms
of \ln of something.

$$\downarrow$$
$$\ln 5^x = \ln 100$$

$$x \ln 5 = \ln 100$$

$$x = \frac{\ln 100}{\ln 5}$$

$$2^x = 3^{1-4x}$$

$$\ln 2^x = \ln 3^{1-4x}$$

$$x \ln 2 = (1-4x) \ln 3$$

$$x \ln 2 = \ln 3 - 4x \ln 3$$

$$x \ln 2 + 4x \ln 3 = \ln 3$$

$$x(\ln 2 + 4 \ln 3) = \ln 3$$

$$x = \frac{\ln 3}{\ln 2 + 4 \ln 3}$$

deriv of $\frac{5x^2 + 7x}{x^4}$ (no quot. rule)

$$(5x^2 + 7x) x^{-4}$$

$$5x^{-2} + 7x^{-3}$$

deriv. is: $-10x^{-3} - 21x^{-4}$