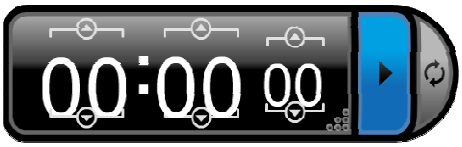
Opener

Non-Calculator



If $y = x^2 e^x$, then $\frac{dy}{dx} =$

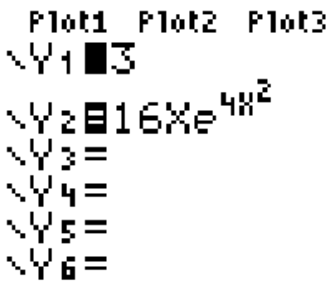
(A) $2xe^x$ (B) $x\left(x + 2e^x\right)$ (C) $xe^x\left(x+2\right)$

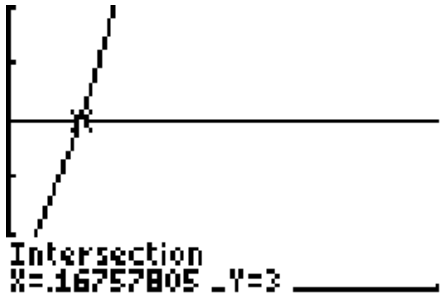
(D) $2x + e^x$ (E) $2x + e$

Calculator

Let f be the function given by $f(x) = 2e^{4x^2}$. For what value of x is the slope of the line tangent to the graph of f at $\left(x, f(x)\right)$ equal to 3?

(A) 0.168 (B) 0.276 (C) 0.318 (D) 0.342 (E) 0.551





Oct 1-7:53 AM

3-9 day 2 Derivatives Logarithmic Functions

Learning Objectives:

I can calculate the derivates of logarithmic functions.

Oct 1-7:53 AM

Derivatives of Logarithmic Functions

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

$$\frac{d}{dx}(\log_b x) = \frac{1}{x} \cdot \frac{1}{\ln b}$$

Oct 1-7:53 AM

Ex1. Differentiate

1.) $y = x^3 \ln x$

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

$y' = 3x^2 \ln x + x^2$

2.) $y = \frac{\ln x}{e^x}$

$y' = \frac{\frac{1}{x}e^x - \ln x \cdot e^x}{(e^x)^2} \cdot x \cdot x$

$y' = \frac{e^x - xe^x \ln x}{x(e^x)^2} = \frac{e^x(1 - x\ln x)}{x(e^x)^2}$

$y' = \frac{1 - x\ln x}{xe^x}$

3.) $y = \ln x \cdot \sin x$

$y' = \frac{1}{x}\sin x + \ln x \cos x$

$y' = \frac{\sin x}{x} + \ln x \cos x$

Oct 1-7:53 AM

4.) $y = \ln(\cos x)$

$y' = \frac{1}{\cos x} \cdot -\sin x$

$y' = \frac{-\sin x}{\cos x} = \boxed{-\tan x}$

5.) $y = (\ln x)^3$

$y' = 3(\ln x)^2 \cdot \frac{1}{x}$ $\boxed{\frac{3(\ln x)^2}{x}}$

6.) $y = \ln\left(\frac{5}{x}\right)$ $\ln(5x^{-1})$

$\frac{1}{5x^{-1}} \cdot -5x^{-2}$

$\frac{x}{5} \cdot \frac{-5}{x^2}$

$\frac{-5x}{5x^2}$

$\frac{-1}{x}$

Oct 1-7:53 AM

7.) $g(x) = \ln(x^2 e^x - x^2)$

$g' = \frac{1}{x^2 e^x - x^2} \cdot \frac{2xe^x + x^2 e^x - 2x}{1}$

$g' = \frac{x(2e^x + xe^x - 2)}{x(xe^x - x)} = \boxed{\frac{2e^x + xe^x - 2}{xe^x - x}}$

8.) $g(x) = \log(4x)$

$g' = \frac{1}{4x} \cdot \frac{1}{\ln 10} \cdot 4$

$g' = \frac{1}{x \ln 10}$

Oct 1-7:53 AM

9.) $h(x) = \sqrt{e^x} \cdot \ln(x^5)$

$h(x) = e^{1/2x} \cdot \ln(x^5)$

f g

$f' = \frac{1}{2}e^{1/2x}$ $g' = \frac{1}{x^5} \cdot 5x^4$

$g' = \frac{5}{x}$

$h' = \frac{1}{2}e^{1/2x} \cdot \ln(x^5) + e^{1/2x} \cdot \frac{5}{x}$

$= \frac{\sqrt{e^x} \cdot \ln(x^5)}{2} + \frac{5\sqrt{e^x}}{x}$

10.) $k(x) = \frac{e^{2x}}{\ln(3x-1)}$ f

$f' = 2e^{2x}$

$g' = \frac{1}{3x-1} \cdot 3$

$g' = \frac{3}{3x-1}$

$K' = \frac{2e^{2x}\ln(3x-1) - e^{2x} \cdot \frac{3}{3x-1}}{[\ln(3x-1)]^2}$ $3x-1$ $3x-1$

$K' = \frac{2(3x-1)e^{2x}\ln(3x-1) - 3e^{2x}}{(3x-1)\ln^2(3x-1)}$

Homework

pg 178 # 15-26, 37, 39, 40, 42, 61, 62

Oct 1-7:53 AM