Name: Richard

QUIZ 14 ♡

MATH 200
October 24, 2022

1. Use logarithmic differentiation to find the derivative of the function $y = \sqrt{e^x \sin(x)\cos(x)}$.

$$y = \left(e^x \sin(x) \cos(x)\right)^{1/2}$$

$$\ln|y| = \ln\left|\left(e^x \sin(x)\cos(x)\right)^{1/2}\right|$$

$$\ln|y| = \frac{1}{2}\ln\left|e^x \sin(x)\cos(x)\right|$$

$$\ln|y| = \frac{1}{2}\left(\ln|e^x| + \ln|\sin(x)| + \ln|\cos(x)|\right)$$

$$\ln|y| = \frac{1}{2}x + \frac{1}{2}\ln|\sin(x)| + \frac{1}{2}\ln|\cos(x)|$$

$$D_x\left[\ln|y|\right] = D_x\left[\frac{1}{2}x + \frac{1}{2}\ln|\sin(x)| + \frac{1}{2}\ln|\cos(x)|\right]$$

$$\frac{y'}{y} = \frac{1}{2} + \frac{1}{2}\frac{\cos(x)}{\sin(x)} - \frac{1}{2}\frac{\sin(x)}{\cos(x)}$$

$$y' = y\left(\frac{1}{2} + \frac{1}{2}\frac{\cos(x)}{\sin(x)} - \frac{1}{2}\frac{\sin(x)}{\cos(x)}\right)$$

$$y' = \sqrt{e^x \sin(x)\cos(x)}\left(\frac{1}{2} + \frac{\cos(x)}{2\sin(x)} - \frac{\sin(x)}{2\cos(x)}\right)$$

$$\boxed{y' = \frac{1}{2}\sqrt{e^x \sin(x)\cos(x)}\left(1 + \cot(x) - \tan(x)\right)}$$

Name: Richard

QUIZ 14 ♣

MATH 200
October 24, 2022

1. Use logarithmic differentiation to find the derivative of the function $y = x^2e^x\sin(x)\cos(x)$.

$$y = x^2 e^x \sin(x)\cos(x)$$

$$\ln|y| = \ln\left|x^2e^x\sin(x)\cos(x)\right|$$

$$\ln|y| = \ln|x^2| + \ln|e^x| + \ln|\sin(x)| + \ln|\cos(x)|$$

$$\ln|y| = 2\ln|x| + x + \ln|\sin(x)| + \ln|\cos(x)|$$

$$D_x\left[\ln|y|\right] = D_x\left[2\ln|x| + x + \ln|\sin(x)| + \ln|\cos(x)|\right]$$

$$\frac{y'}{y} = 2\frac{1}{x} + 1 + \frac{\cos(x)}{\sin(x)} - \frac{\sin(x)}{\cos(x)}$$

$$y' = y\left(\frac{2}{x} + 1 + \frac{\cos(x)}{\sin(x)} - \frac{\sin(x)}{\cos(x)}\right)$$

$$\boxed{y' = x^2e^x\sin(x)\cos(x)\left(\frac{2}{x} + 1 + \frac{\cos(x)}{\sin(x)} - \frac{\sin(x)}{\cos(x)}\right)}$$

Name: Richard

Quiz 14 ◊

MATH 200
October 24, 2022

1. Use logarithmic differentiation to find the derivative of the function $y = \dfrac{1}{e^x \sin(x)\cos(x)}$.

$$y = \frac{1}{e^x \sin(x)\cos(x)}$$

$$\ln|y| = \ln\left|\frac{1}{e^x \sin(x)\cos(x)}\right|$$

$$\ln|y| = \ln|1| - \ln|e^x \sin(x)\cos(x)|$$

$$\ln|y| = 0 - \ln|e^x| - \ln|\sin(x)| - \ln|\cos(x)|$$

$$\ln|y| = -x - \ln|\sin(x)| - \ln|\cos(x)|$$

$$D_x\left[\ln|y|\right] = D_x\left[-x - \ln|\sin(x)| - \ln|\cos(x)|\right]$$

$$\frac{y'}{y} = -1 - \frac{\cos(x)}{\sin(x)} + \frac{\sin(x)}{\cos(x)}$$

$$y' = y\left(-1 - \frac{\cos(x)}{\sin(x)} + \frac{\sin(x)}{\cos(x)}\right)$$

$$\boxed{y' = \frac{1}{e^x \sin(x)\cos(x)}\left(-1 - \frac{\cos(x)}{\sin(x)} + \frac{\sin(x)}{\cos(x)}\right)}$$

Name: Richard

QUIZ 14 ♠

MATH 200

October 24, 2022

1. Use logarithmic differentiation to find the derivative of the function $y = xe^x \sin^2(x)$.

$$y = xe^x \sin^2(x)$$

$$\ln|y| = \ln|xe^x \sin^2(x)|$$

$$\ln|y| = \ln|x| + \ln|e^x| + \ln|\sin^2(x)|$$

$$\ln|y| = \ln|x| + x + 2\ln|\sin(x)|$$

$$D_x\left[\ln|y|\right] = D_x\left[\ln|x| + x + 2\ln|\sin(x)|\right]$$

$$\frac{y'}{y} = \frac{1}{x} + 1 + 2\frac{\cos(x)}{\sin(x)}$$

$$y' = y\left(\frac{1}{x} + 1 + 2\frac{\cos(x)}{\sin(x)}\right)$$

$$y' = xe^x\sin^2(x)\left(\frac{1}{x} + 1 + 2\frac{\cos(x)}{\sin(x)}\right)$$

$$\boxed{y' = e^x\sin^2(x) + xe^x\sin^2(x) + 2xe^x\sin(x)\cos(x)}$$