Name: Richard

Quiz 14

MATH 200
October 8, 2024

1. Use logarithmic differentiation to find the derivative of $y = \frac{x^8 \sqrt[3]{\sin(x)}}{\cos(x)^x}$. $= \frac{x^8(\sin(x))^{1/3}}{\cos(x)^x}$

$$\ln|y| = \ln\left|\frac{x^8(\sin(x))^{1/3}}{\cos(x)^x}\right|$$

$$\ln|y| = \ln|x^8| + \ln\left|(\sin(x))^{\frac{1}{3}}\right| - \ln|\cos(x)^x|$$

$$\ln|y| = 8\ln|x| + \frac{1}{3}\ln|\sin(x)| - x\ln|\cos(x)|$$

$$D_x\left[\ln|y|\right] = D_x\left[8\ln|x| + \frac{1}{3}\ln|\sin(x)| - x\ln|\cos(x)|\right]$$

$$\frac{y'}{y} = \frac{8}{x} + \frac{1}{3}\frac{\cos(x)}{\sin(x)} - 1\ln|\cos(x)| - x\frac{(-\sin(x))}{\cos(x)}$$

$$y' = y\left(\frac{8}{x} + \frac{1}{3}\cot(x) - \ln|\cos(x)| + x\tan(x)\right)$$

$$\boxed{y' = \frac{x^8\sqrt{\sin(x)}}{\cos(x)^x}\left(\frac{8}{x} + \frac{1}{3}\cot(x) - \ln|\cos(x)| + x\tan(x)\right)}$$

Name: Richard

QUIZ 14

MATH 200
October 8, 2024

1. Use logarithmic differentiation to find the derivative of $y = \frac{\cos(x)^x}{x^8 \sqrt[3]{\sin(x)}}$. $= \frac{\cos(x)^x}{x^8(\sin(x))^{1/3}}$

$$\ln|y| = \ln\left|\frac{\cos(x)^x}{x^8(\sin(x))^{1/3}}\right|$$

$$\ln|y| = \ln|\cos(x)^x| - \ln|x^8(\sin(x))^{1/3}|$$

$$\ln|y| = x\ln|\cos(x)| - (\ln|x^8| + \ln|(\sin(x))^{1/3}|)$$

$$\ln|y| = x\ln|\cos(x)| - 8\ln|x| - \frac{1}{3}\ln|\sin(x)|$$

$$D_x[\ln|y|] = D_x\left[x\ln|\cos(x)| - 8\ln|x| - \frac{1}{3}\ln|\sin(x)|\right]$$

$$\frac{y'}{y} = 1\cdot\ln|\cos(x)| + x\frac{-\sin(x)}{\cos(x)} - 8\frac{1}{x} - \frac{1}{3}\frac{\cos(x)}{\sin(x)}$$

$$y' = y\left(\ln|\cos(x)| - x\tan(x) - \frac{8}{x} - \frac{1}{3}\cot(x)\right)$$

$$\boxed{y' = \frac{\cos(x)^x}{x^8\sqrt[3]{\sin(x)}}\left(\ln|\cos(x)| - x\tan(x) - \frac{8}{x} - \frac{1}{3}\cot(x)\right)}$$