PROBLEM 1

Find dy/dx of $y = \cot\left(\frac{5}{x}\right)$

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Find dy/dx of $y = \cot\left(\frac{5}{x}\right)$

$\frac{dy}{dx} = -\csc^2\left(\frac{5}{x}\right) \cdot \left(-5x^{-2}\right)$

$= \frac{5\csc^2\left(\frac{5}{x}\right)}{x^2}$

PROBLEM 2

Find dy/dx of $y = 5x\sqrt{4x^2 + 5x}$

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Find dy/dx of $y = 5x\sqrt{4x^2 + 5x}$ $= 5x(4x^2+5x)^{1/2}$

$\frac{dy}{dx} = 5x\left(\frac{1}{2}(4x^2+5x)^{-1/2}(8x+5)\right) + 5\left(4x^2+5x\right)^{1/2}$

PROBLEM 3

Find dy/dx of $y = \ln(4x^3)$

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Find dy/dx of $y = \ln(4x^3)$

$\frac{dy}{dx} = \frac{1}{4x^3} \cdot 12x^2 = \frac{3}{x}$

PROBLEM 4

Find dy/dx of $y = e^{4+\ln x}$

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Find dy/dx of $y = e^{4+\ln x}$ $e^4 \cdot e^{\ln x}$

$\frac{dy}{dx} = e^4$

PROBLEM 5

Find dy/dx of $y = \log_7(5x)$

PROBLEM 5

Find dy/dx of $y = \log_7(5x)$ $= \frac{\ln 5x}{\ln 7}$

$= \frac{1}{\ln 7} \cdot \ln 5x$

$\frac{dy}{dx} = \frac{1}{\ln 7} \cdot \frac{d}{dx}(\ln 5x)$

$= \frac{1}{\ln 7} \cdot \frac{1}{5x} \cdot 5$

$= \frac{1}{x \ln 7}$

PROBLEM 6

Find dy/dx of $y = \cos^{-1}(2x)$

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Find dy/dx of $y = \cos^{-1}(2x)$

$\frac{dy}{dx} = \frac{-1}{\sqrt{1-(2x)^2}} \cdot 2 = \frac{-2}{\sqrt{1-4x^2}}$

PROBLEM 7

Find dy/dx of $y = x^{\tan x}$

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Find dy/dx of $y = x^{\tan x}$

$\ln y = \tan x \ln x$

$\frac{1}{y} \cdot \frac{dy}{dx} = \tan x \left(\frac{1}{x}\right) + \ln x \left(\sec^2 x\right)$

$\frac{1}{y}\frac{dy}{dx} = \frac{\tan x}{x} + \ln x (\sec^2 x)$

$\frac{dy}{dx} = y\left(\frac{\tan x}{x} + \ln x (\sec^2 x)\right)$

$= x^{\tan x}\left(\frac{\tan x}{x} + \ln x (\sec^2 x)\right)$

PROBLEM 8

Find dy/dx of $xy + 2x + 3y = 9$

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Find dy/dx of $xy + 2x + 3y = 9$

$x\frac{dy}{dx} + y + 2 + 3\frac{dy}{dx} = 0$

$\frac{x\,dy}{dx} + 3\frac{dy}{dx} = -y - 2$

$\frac{dy}{dx}(x+3) = -y - 2$

$\frac{dy}{dx} = \frac{-y-2}{x+3}$

PROBLEM 9

Find $\frac{d^2y}{dx^2}$ of $y^2 - x^2 = 24$

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Find $\frac{d^2y}{dx^2}$ of $y^2 - x^2 = 24$

$2y\frac{dy}{dx} - 2x = 0$

$\frac{dy}{dx} = \frac{x}{y}$

$\frac{d^2y}{dx^2} = \frac{y(1) - x\frac{dy}{dx}}{y^2}$

$= \frac{\left(y - x\frac{x}{y}\right)y}{y^2}\left(y\right)$

$= \frac{y^2 - x^2}{y^3} = \frac{24}{y^3}$

PROBLEM 10

Find the equation of the tangent line of $x^2+4y^2=5$ at (-1,1).

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Find the equation of the tangent line of $x^2+4y^2=5$ at (-1,1).

$2x+8y\frac{dy}{dx}=0$

$x+4y\frac{dy}{dx}=0$

$\frac{dy}{dx}=\frac{-x}{4y}=\frac{1}{4}$

$y-1=\frac{1}{4}(x+1)$