Q1

Wednesday, September 23, 2020 8:06 AM

Find dy/dx by implicit differentiation.

$$x^2 - 8xy + y^2 = 8$$

$$y' = \boxed{\frac{-x+4y}{-4x+y}}$$

The Product Rule

$$\frac{d}{dx}[f(x)g(x)] = f(x)\frac{d}{dx}[g(x)] + g(x)\frac{d}{dx}[f(x)]$$

$$x^2 - 8xy + y^2 = 8$$

$$\frac{d}{dx}(x^2 - 8xy + y^2) = \frac{d}{dx}(8)$$

$$2x - \left[8x\frac{d}{dy}(y) + y\frac{d}{dx}(8x)\right] + \frac{d}{dy}(y^2) = 0$$

$$2x - 8xy' - 8y + 2yy' = 0$$

$$-8xy' + 2yy' = -2x + 8y$$

$$\frac{(-8x+2y)y'}{(-8x+2y)} = \frac{-2x+8y}{(-8x+2y)}$$

$$y' = \frac{-2x+8y}{-8x+2y}$$

$$y' = \frac{\cancel{2}(-x+4y)}{\cancel{2}(-4x+y)}$$

$$\boxed{y' = \frac{-x+4y}{-4x+y}}$$

Q2

Wednesday, September 23, 2020 8:38 AM

Find dy/dx by implicit differentiation.

$$\frac{x^2}{x+y} = y^2 + 9$$

$$y' = \boxed{\frac{x(x+2y)}{2y(x+y)^2 + x^2}}$$

The Quotient Rule

$$\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{g(x)\frac{d}{dx}[f(x)] - f(x)\frac{d}{dx}[g(x)]}{[g(x)]^2}$$

$$\frac{x^2}{x+y} = y^2 + 9$$

$$\frac{d}{dx}\left(\frac{x^2}{x+y}\right) = \frac{d}{dx}(y^2 + 9)$$

$$\frac{(x+y)\frac{d}{dx}(x^2) - x^2\frac{d}{dx}(x+y)}{(x+y)^2} = \frac{d}{dy}(y^2)\frac{dy}{dx} + 0$$

$$\frac{(x+y)(2x) - x^2\left[1 + \frac{d}{dy}(y)\right]}{(x+y)^2} = 2yy'$$

$$\frac{2x^2 + 2xy - x^2(1+y')}{(x+y)^2} = 2yy'$$

$$\cancel{(x+y)^2}\,\frac{2x^2 + 2xy - x^2 - x^2y'}{\cancel{(x+y)^2}} = 2yy'(x+y)^2$$

$$x^2 + 2xy - x^2y' = 2yy'(x+y)^2$$

$$x^2 + 2xy = 2yy'(x+y)^2 + x^2y'$$

$$x^2 + 2xy = [2y(x+y)^2 + x^2]y'$$

$$\frac{x^2 + 2xy}{[2y(x+y)^2 + x^2]} = \frac{\cancel{[2y(x+y)^2 + x^2]}\,y'}{\cancel{[2y(x+y)^2 + x^2]}}$$

$$\boxed{\frac{x(x+2y)}{2y(x+y)^2 + x^2} = y'}$$

Q3

Wednesday, September 23, 2020 9:11 AM

Find dy/dx by implicit differentiation.

$$xe^y = x - y$$

$$y' = \boxed{\frac{1 - e^y}{xe^y + 1}}$$

The Product Rule

$$\frac{d}{dx}[f(x)g(x)] = f(x)\frac{d}{dx}[g(x)] + g(x)\frac{d}{dx}[f(x)]$$

$$\frac{d}{dy}(e^y) = e^y \cdot y'$$

$$xe^y = x - y$$

$$\frac{d}{dx}(xe^y) = \frac{d}{dx}(x - y)$$

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

$$xe^y y' + e^y(1) = 1 - y'$$

$$xe^y y' + y' = 1 - e^y$$

$$\frac{y'\cancel{(xe^y + 1)}}{\cancel{(xe^y + 1)}} = \frac{1 - e^y}{(xe^y + 1)}$$

$$\boxed{y' = \frac{1 - e^y}{xe^y + 1}}$$

Q4

Wednesday, September 23, 2020 10:06 AM

Find dy/dx by implicit differentiation.

$\cos(xy) = 1 + \sin(y)$

$y' = \boxed{\dfrac{-\sin(xy)y}{\cos(y) + \sin(xy)x}}$

The Product Rule

$$\frac{d}{dx}[f(x)g(x)] = f(x)\frac{d}{dx}[g(x)] + g(x)\frac{d}{dx}[f(x)]$$

$$\cos(xy) = 1 + \sin(y)$$

$$\frac{d}{dx}[\cos(xy)] = \frac{d}{dx}[1 + \sin(y)]$$

chain Rule

$u = xy$

$f(x) = \cos(u) = y$

$\frac{dy}{du} \cdot \frac{du}{dx}$

$$\frac{dy}{du}[\cos(u)]\frac{du}{dx}(xy) = 0 + \frac{d}{dy}[\sin(y)]\frac{dy}{dx}$$

$$-\sin(u)\left[x\frac{d}{dx}(y) + y\frac{d}{dx}(x)\right] = \cos(y)y'$$

$$-\sin(xy)[xy' + y(1)] = \cos(y)y'$$

$$-\sin(xy)xy' - \sin(xy)y = \cos(y)y'$$

$$-\sin(xy)y = \cos(y)y' + \sin(xy)xy'$$

$$-\sin(xy)y = y'[\cos(y) + \sin(xy)x]$$

$$\frac{-\sin(xy)y}{[\cos(y) + \sin(xy)x]} = \frac{y'\cancel{[\cos(y) + \sin(xy)x]}}{\cancel{[\cos(y) + \sin(xy)x]}}$$

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

Q5

Wednesday, September 23, 2020 10:32 AM

Find dy/dx by implicit differentiation.

$e^{x/y} = 9x - y$

$$y' = \frac{9y^2 - e^{\left(\frac{x}{y}\right)}y}{-e^{\left(\frac{x}{y}\right)}x + y^2}$$

The Quotient Rule

$$\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{g(x)\frac{d}{dx}[f(x)] - f(x)\frac{d}{dx}[g(x)]}{[g(x)]^2}$$

$$\frac{d}{dy}(e^y) = e^y \cdot y'$$

$$e^{x/y} = 9x - y$$

$$\frac{d}{dx}\left(e^{x/y}\right) = \frac{d}{dx}(9x - y)$$

$$\frac{d}{dy}\left(e^{x/y}\right)\frac{dy}{dx} = 9 - y'$$

$$e^{x/y}\left(\frac{x}{y}\right)' = 9 - y'$$

$$e^{x/y}\left[\frac{y\frac{d}{dx}(x) - x\frac{d}{dx}(y)}{(y)^2}\right] = 9 - y'$$

$$e^{x/y}\left[\frac{y - xy'}{y^2}\right] = 9 - y'$$

$$\frac{e^{x/y}(y - xy')}{y^2} = 9 - y'$$

$$\frac{e^{x/y}y}{y^2} - \frac{e^{x/y}xy'}{y^2} = 9 - y'$$

$$\frac{e^{x/y}}{y} - \frac{e^{x/y}xy'}{y^2} = 9 - y'$$

$$-\frac{e^{x/y}xy'}{y^2} + y' = 9 - \frac{e^{x/y}}{y}$$

$$y'\left(-\frac{e^{x/y}x}{y^2} + 1\right) = 9 - \frac{e^{x/y}}{y}$$

$$\frac{y'\cancel{\left(-\frac{e^{x/y}x}{y^2} + 1\right)}}{\cancel{\left(-\frac{e^{x/y}x}{y^2} + 1\right)}} = \frac{9 - \frac{e^{x/y}}{y}}{\left(-\frac{e^{x/y}x}{y^2} + 1\right)}$$

$$y' = \frac{9 - \frac{e^{x/y}}{y}}{\left(-\frac{e^{x/y}x}{y^2} + 1\right)} \cdot \frac{y^2}{y^2}$$

$$\boxed{y' = \frac{9y^2 - e^{x/y}y}{-e^{x/y}x + y^2}}$$

Q6

Wednesday, September 23, 2020 11:17 AM

Find dy/dx by implicit differentiation.

$x \sin(y) + y \sin(x) = 9$

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

The Product Rule

$$\frac{d}{dx}[f(x)g(x)] = f(x)\frac{d}{dx}[g(x)] + g(x)\frac{d}{dx}[f(x)]$$

$$x\sin(y) + y\sin(x) = 9$$

$$\left[x\frac{d}{dx}[\sin(y)] + \sin(y)\frac{d}{dy}(x)\right] + \left[y\frac{d}{dx}[\sin(x)] + \sin(x)\frac{d}{dx}(y)\right] = \frac{d}{dx}(9)$$

$$\left[x\frac{d}{dy}[\sin(y)]\frac{dy}{dx} + \sin(y)(1)\right] + \left[y\frac{d}{dy}[\sin(x)]\frac{dy}{dx} + \sin(x)\,y'\right] = 0$$

$$x\cos(y)y' + \sin(y) + y\cos(x) + \sin(x)y' = 0$$

$$x\cos(y)y' + \sin(x)y' = -\sin(y) - y\cos(x)$$

$$y'[x\cos(y) + \sin(x)] = -\sin(y) - y\cos(x)$$

$$\frac{y'\cancel{[x\cos(y) + \sin(x)]}}{\cancel{[x\cos(y) + \sin(x)]}} = \frac{-\sin(y) - y\cos(x)}{[x\cos(y) + \sin(x)]}$$

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

Q7

Wednesday, September 23, 2020 12:34 PM

Regard y as the independent variable and x as the dependent variable and use implicit differentiation to find dx/dy.

$x^5y^2 - x^5y + 2xy^3 = 0$

$x' = \boxed{\dfrac{-2x^5y + x^5 - 6xy^2}{5x^4y^2 - 5x^4y + 2y^3}}$

The Product Rule

$$\frac{d}{dx}[f(x)g(x)] = f(x)\frac{d}{dx}[g(x)] + g(x)\frac{d}{dx}[f(x)]$$

$$x^5y^2 - x^5y + 2xy^3 = 0$$

Note: find $\frac{dx}{dy}$ not $\frac{dy}{dx}$

$$\left[x^5\frac{d}{dy}(y^2) + y^2\frac{d}{dy}(x^5)\right]\left[x^5\frac{d}{dy}(y) + y\frac{d}{dy}(x^5)\right] + \left[2x\frac{d}{dy}(y^3) + y^3\frac{d}{dy}(2x)\right] = 0$$

$$\left[x^5(2y) + y^2\frac{d}{dx}(x^5)\frac{dx}{dy}\right] - \left[x^5(1) + y\frac{d}{dx}(x^5)\frac{dx}{dy}\right] + \left[2x(3y^2) + y^3\frac{d}{dx}(2x)\frac{dx}{dy}\right] = 0$$

$$\left[2x^5y + 5x^4y^2x'\right] - \left[x^5 + 5x^4yx'\right] + \left[6xy^2 + 2y^3x'\right] = 0$$

$$2x^5y + 5x^4y^2x' - x^5 - 5x^4yx' + 6xy^2 + 2y^3x' = 0$$

$$5x^4y^2x' - 5x^4yx' + 2y^3x' = -2x^5y + x^5 - 6xy^2$$

$$x'(5x^4y^2 - 5x^4y + 2y^3) = -2x^5y + x^5 - 6xy^2$$

$$\frac{x'\cancel{(5x^4y^2 - 5x^4y + 2y^3)}}{\cancel{(5x^4y^2 - 5x^4y + 2y^3)}} = \frac{-2x^5y + x^5 - 6xy^2}{(5x^4y^2 - 5x^4y + 2y^3)}$$

$$\boxed{x' = \frac{-2x^5y + x^5 - 6xy^2}{5x^4y^2 - 5x^4y + 2y^3}}$$

Q8

Wednesday, September 23, 2020 2:53 PM

Use implicit differentiation to find an equation of the tangent line to the curve at the given point.

$y\sin(16x) = x\cos(2y), \quad (\pi/2, \pi/4)$

$y = \boxed{-4x + \frac{9\pi}{4}}$

The Product Rule

$\frac{d}{dx}[f(x)g(x)] = f(x)\frac{d}{dx}[g(x)] + g(x)\frac{d}{dx}[f(x)]$

$y\sin(16x) = x\cos(2y), \quad \left(\frac{\pi}{2}, \frac{\pi}{4}\right)$

$$\frac{d}{dx}[y\sin(16x)] = \frac{d}{dx}[x\cos(2y)]$$

$$\left[\underbrace{y\frac{d}{dx}[\sin(16x)]} + \sin(16x)\frac{d}{dx}(y)\right] = \left[x\frac{d}{dx}[\cos(2y)] + \cos(2y)\frac{d}{dx}(x)\right]$$

Chain Rule
$u = 16x$
$f(u) = \cos(u) = y$
$\frac{dy}{du}\frac{du}{dx}$

$$y\cos(u)\frac{du}{dx}(16x) + \sin(16x)y' = x\frac{d}{dy}[\cos(2y)]\frac{dy}{dx} + \cos(2y)(1)$$

$$y\cos(16x)(16) + \sin(16x)y' = x[-\sin(2y)]2y' + \cos(2y)$$

$$16y\cos(16x) + \sin(16x)y' = -2x\sin(2y)y' + \cos(2y)$$

$$\sin(16x)y' + 2x\sin(2y)y' = \cos(2y) - 16y\cos(16x)$$

$$y'[\sin(16x) + 2x\sin(2y)] = \cos(2y) - 16y\cos(16x)$$

$$\frac{y'\cancel{[\sin(16x) + 2x\sin(2y)]}}{\cancel{[\sin(16x) + 2x\sin(2y)]}} = \frac{\cos(2y) - 16y\cos(16x)}{[\sin(16x) + 2x\sin(2y)]}$$

$$y' = \frac{\cos(2y) - 16y\cos(16x)}{\sin(16x) + 2x\sin(2y)}$$

$$y' = \frac{\cos\left(2\frac{\pi}{4}\right) - 16\left(\frac{\pi}{4}\right)\cos\left(16\cdot\frac{\pi}{2}\right)}{\sin\left(16\cdot\frac{\pi}{2}\right) + 2\left(\frac{\pi}{2}\right)\sin\left(2\cdot\frac{\pi}{4}\right)} \longrightarrow \text{Plug } \left(\frac{\pi}{2}, \frac{\pi}{4}\right)$$

$$= \frac{0 - \frac{16\pi}{4}(1)}{0 + \pi(1)}$$

$$y' = \frac{-4\pi}{\pi} = -4$$

$$m = \frac{\Delta y}{\Delta x} = \frac{y - y_1}{x - x_1}$$

$$m = \frac{\Delta y}{\Delta x} = -4 = \frac{y - \frac{\pi}{4}}{x - \frac{\pi}{2}}$$

$$\left(x - \frac{\pi}{2}\right) - 4 = \frac{y - \frac{\pi}{4}}{\cancel{x - \frac{\pi}{2}}} \cancel{\left(x - \frac{\pi}{2}\right)}$$

$$-4\left(x - \frac{\pi}{2}\right) = y - \frac{\pi}{4}$$

$$y = -4\left(x - \frac{\pi}{2}\right) + \frac{\pi}{4}$$

$$y = -4x + 2\pi + \frac{\pi}{4} \longrightarrow$$

$$\boxed{y = -4x + \frac{9\pi}{4}}$$

$$2\pi + \frac{\pi}{4}$$

$$\frac{2\pi(4)}{4} + \frac{\pi}{4}$$

$$\frac{8\pi}{4} + \frac{\pi}{4} = \frac{9\pi}{4}$$

Q9

Wednesday, September 23, 2020 7:16 PM

Use implicit differentiation to find an equation of the tangent line to the curve at the given point.

$x^2 + y^2 = (5x^2 + 4y^2 - x)^2$
(0, 0.25)
(cardioid)

$y = \boxed{x + \frac{1}{4}}$ ✓

$$x^2 + y^2 = (5x^2 + 4y^2 - x)^2 \quad , \quad (0, 0.25)$$

$$\frac{d}{dx}(x^2 + y^2) = \frac{d}{dx}(5x^2 + 4y^2 - x)^2$$

Chain Rule

$u = 5x^2 + 4y^2 - x$

$f(u) = u^2 = y$

$\frac{dy}{du} \cdot \frac{du}{dx}$

$$2x + \frac{d}{dy}(y^2)\frac{dy}{dx} = \frac{dy}{du}(u^2)\frac{du}{x}(5x^2 + 4y^2 - x)$$

$$2x + (2y)y' = 2u\left(10x + 4\frac{d}{dy}(y^2)y' - 1\right)$$

$$2x + 2yy' = 2(5x^2 + 4y^2 - x)(10x + 8yy' - 1)$$

$$2x + 2yy' = (10x^2 + 8y^2 - 2x)(10x + 8yy' - 1)$$

$$2x + 2yy' = (10x^2 + 8y^2 - 2x)(10x + 8yy' - 1)$$

$$2x + 2yy' = (10x^2 + 8y^2 - 2x)(10x + 8yy' - 1) \rightarrow \text{plug } (0, 0.25) \text{ or } \left(0, \tfrac{1}{4}\right)$$

$$2(0) + 2\left(\tfrac{1}{4}\right)y' = \left[10(0)^2 + 8\left(\tfrac{1}{4}\right)^2 - 2(0)\right]\left[10(0) + 8\left(\tfrac{1}{4}\right)y' - 1\right]$$

$$\tfrac{1}{2}y' = \left(0 + \tfrac{1}{2} - 0\right)(0 + 2y' - 1)$$

$$\tfrac{1}{2}y' = \tfrac{1}{2}(2y' - 1)$$

$$\tfrac{1}{2}y' = y' - \tfrac{1}{2}$$

$$\tfrac{1}{2}y' - y' = -\tfrac{1}{2}$$

$$-\tfrac{1}{2}y' = -\tfrac{1}{2}$$

$$\frac{-\frac{1}{2}y'}{-\frac{1}{2}} = \frac{-\frac{1}{2}}{-\frac{1}{2}}$$

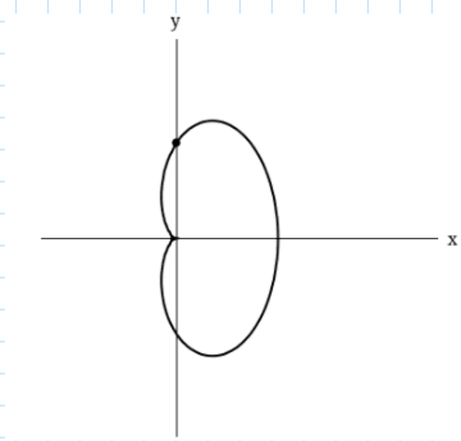
$$y = 1 = m$$

$$y - y_1 = m(x - x_1) \quad , \quad \left(0, \tfrac{1}{4}\right)$$

$$y - \left(\tfrac{1}{4}\right) = 1(x - 0)$$

$$y - \tfrac{1}{4} = x$$

$$\boxed{y = x + \tfrac{1}{4}}$$



Q10

Wednesday, September 23, 2020 8:54 PM

Find y'' by implicit differentiation.

$$x^2 + 9y^2 = 9$$

$$y'' = -\frac{1}{9y^3}$$

The Quotient Rule

$$\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{g(x)\frac{d}{dx}[f(x)] - f(x)\frac{d}{dx}[g(x)]}{[g(x)]^2}$$

$$x^2 + 9y^2 = 9$$

$$\frac{d}{dx}(x^2 + 9y^2) = \frac{d}{dx}(9)$$

$$2x + 9\frac{d}{dy}(y^2)\frac{dy}{dx} = 0$$

$$2x + 18yy' = 0$$

$$18yy' = -2x$$

$$\frac{\cancel{18y}y'}{\cancel{18y}} = \frac{-2x}{18y}$$

$$y' = -\frac{x}{9y}$$

$$y'' = -\frac{x}{9y}$$

$$= \frac{d}{dx}\left(-\frac{x}{9y}\right)$$

$$= -\left[\frac{9y\frac{d}{dx}(x) - x\frac{d}{dy}(9y)}{(9y)^2}\right]$$

$$= -\frac{9y(1) - x\,9\frac{d}{dy}(y)\frac{dy}{dx}}{(9y)^2}$$

$$= -\frac{9y - 9xy'}{81y^2}$$

$$= -\frac{9y - 9x\left(\frac{x}{9y}\right)}{18y^2}$$

$$= \frac{\left(9y + \frac{x^2}{y}\right)(y)}{(81y^2)(y)}$$

$$= -\frac{9y^2 + x^2}{81y^3}$$

$$= -\frac{(9)}{81y^3}$$

$$\boxed{y'' = -\frac{1}{9y^3}}$$

Q11

Thursday, September 24, 2020 11:55 AM

Find the derivative of the function.

$y = (\tan^{-1}(9x))^2$

$y' = \boxed{\dfrac{18\tan^{-1}(9x)}{1+81x^2}}$

$$y = (\tan^{-1}(9x))^2$$

$$y' = \frac{d}{dx}\left[(\tan^{-1}(9x))^2\right]$$

Chain Rule

$u = \tan^{-1}(9x)$

$f(u) = u^2 = y$

$\frac{dy}{du} \cdot \frac{du}{dx}$

$$= \frac{dy}{du}(u^2)\frac{du}{du}\left[\tan^{-1}(9x)\right]$$

Chain Rule

$v = 9x$

$f(v) = \tan^{-1}(v) = y$

$\frac{dy}{dv} \cdot \frac{dv}{dx}$

$$= 2u \frac{dy}{dv}\left[\tan^{-1}(v)\right]\frac{dv}{dx}(9x)$$

$$= 2\left[\tan^{-1}(9x)\right]\left(\frac{1}{1+(v)^2}\right)(9)$$

$$= 2\tan^{-1}(9x)\left(\frac{1}{1+(9x)^2}\right)9$$

$$= 18\tan^{-1}(9x)\left(\frac{1}{1+81x^2}\right)$$

$$\boxed{y' = \frac{18\tan^{-1}(9x)}{1+81x^2}}$$

Q12

Thursday, September 24, 2020 1:20 PM

Find the derivative of the function.

$y = \sin^{-1}(8x + 1)$

$y' = \dfrac{8}{\sqrt{-64x^2 - 16x}}$

$$y = \sin^{-1}(8x+1)$$

$$y' = \frac{d}{dx}\left[\sin^{-1}(8x+1)\right]$$

$$= \frac{dy}{du}\left[\sin^{-1}(u)\right]\frac{du}{dx}(8x+1)$$

$$= \left(\frac{1}{\sqrt{1-(u)^2}}\right)(8+0)$$

$$= \left(\frac{1}{\sqrt{1-(8x+1)^2}}\right)8$$

$$= \frac{8}{\sqrt{1-(64x^2+16x+1)}}$$

$$= \frac{8}{\sqrt{1-64x^2-16x-1}}$$

$$\boxed{y' = \frac{8}{\sqrt{-64x^2-16x}}}$$

Chain Rule

$u = 8x + 1$

$f(u) = \sin^{-1}(u) = y$

$\frac{dy}{du} \cdot \frac{du}{dx}$

Q13

Thursday, September 24, 2020 1:47 PM

Find the derivative of the function.

$$y = 9\tan^{-1}\left(x + \sqrt{1+x^2}\right)$$

$$y' = \frac{9x + 9\sqrt{1+x^2}}{\left(2x^2 + 2x\sqrt{1+x^2} + 2\right)\sqrt{1+x^2}}$$

$$y = 9\tan^{-1}\left(x + \sqrt{1+x^2}\right)$$

$$y' = \frac{d}{dx}\left[9\tan^{-1}\left(x + \sqrt{1+x^2}\right)\right]$$

chain Rule

$u = x + \sqrt{1+x^2}$

$f(u) = \tan^{-1}(u) = y$

$\frac{dy}{du} \cdot \frac{du}{dx}$

$$= 9\frac{dy}{du}\left[\tan^{-1}(u)\right]\frac{du}{dx}\left(x + \sqrt{1+x^2}\right)$$

chain Rule

$v = 1 + x^2$

$f(v) = \sqrt{v} = y$

$\frac{dy}{dv} \cdot \frac{dv}{dx}$

$$= 9\left[\frac{1}{1+(u)^2}\right]\left[1 + \frac{dy}{dv}\left(\sqrt{v}\right)\frac{dv}{dx}\left(1+x^2\right)\right]$$

$$= \left[\frac{9}{1+\left(x+\sqrt{1+x^2}\right)^2}\right]\left[1 + \frac{dy}{dv}\left(v^{\frac{1}{2}}\right)(0+2x)\right]$$

$$= \left[\frac{9}{1+\left(x^2+2x\sqrt{1+x^2}+1+x^2\right)}\right]\left[1+\frac{1}{2}v^{-1/2}(2x)\right]$$

$$= \left(\frac{9}{1+2x^2+2x\sqrt{1+x^2}+1}\right)\left[1+x\left(1+x^2\right)^{-1/2}\right]$$

$$= \left(\frac{9}{2x^2+2x\sqrt{1+x^2}+2}\right)\left(1+\frac{x}{\sqrt{1+x^2}}\right)$$

$$= \left(\frac{9}{2x^2+2x\sqrt{1+x^2}+2}\right)\left(\frac{1\left(\sqrt{1+x^2}\right)}{\left(\sqrt{1+x^2}\right)}+\frac{x}{\sqrt{1+x^2}}\right)$$

$$= \left(\frac{9}{2x^2+2x\sqrt{1+x^2}+2}\right)\left(\frac{x+\sqrt{1+x^2}}{\sqrt{1+x^2}}\right)$$

$$= \frac{9x+9\sqrt{1+x^2}}{\left(2x^2+2x\sqrt{1+x^2}+2\right)\left(\sqrt{1+x^2}\right)}$$

$$\boxed{y' = \frac{9x+9\sqrt{1+x^2}}{\left(2x^2+2x\sqrt{1+x^2}+2\right)\sqrt{1+x^2}}}$$