

4.2 day 1

Tuesday, October 3, 2017 7:57 PM

Steei check!

A. solve for w:

$$3xw - 2z + 8yw = 11aw$$

$$3xw + 8yw - 11aw = 2z$$

$$w(3x + 8y - 11a) = 2z$$

$$w = \frac{2z}{3x + 8y - 11a}$$

B. Factor + simplify

$$\frac{1}{2}x^{-1/2}(5x+4)^3 \cdot 6 - x^{1/2}(5x+4)^2 \cdot 8$$

$$= x^{-1/2}(5x+4)^2 [3(5x+4) - x^{2/2} \cdot 8]$$

$$= x^{-1/2}(5x+4)^2 [7x + 12]$$

Find $\frac{dy}{dx}$.

① $x^2 + y^2 = 16$

$$\frac{d}{dx}(x^2 + y^2) = \frac{d}{dx}(16)$$

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

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

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

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

$$(2) \quad y^3 = \frac{x-1}{x+1}$$

$$\frac{d}{dx} y^3 = \frac{d}{dx} \left(\frac{x-1}{x+1} \right)$$

$$3y^2 \cdot \frac{dy}{dx} = \frac{(x+1) \cdot \frac{dx}{dx} - (x-1) \cdot \frac{dx}{dx}}{(x+1)^2}$$

$$3y^2 \cdot \frac{dy}{dx} = \frac{x+1 - x+1}{(x+1)^2}$$

$$3y^2 \frac{dy}{dx} = \frac{2}{(x+1)^2}$$

$$\frac{dy}{dx} = \frac{2}{3y^2(x+1)^2}$$

$$(3) \quad x + \cos y = xy$$

$$1 \cdot \frac{dx}{dx} + \cos y \left(\frac{dy}{dx} \right) = x \cdot \left(\frac{dy}{dx} \right) + y \cdot \frac{dx}{dx}$$

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

$$\frac{dy}{dx} (\cos y - x) = y - 1$$

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

$$(4) \quad x^2 + xy - y^2 = 1$$

$$2x \frac{dx}{dx} + x \left(\frac{dy}{dx} \right) + y \cdot \frac{dx}{dx} - 2y \left(\frac{dy}{dx} \right) = 0 \frac{dx}{dx}$$

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

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

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

#21 from HW

Find the equation of the tangent line to

$$6x^2 + (3x)y + 2y^2 + 17y - 6 = 0 \quad \text{at } (-1, 0)$$

$$12x \frac{dx}{dx} + 3x \left(\frac{dy}{dx} \right) + y \cdot 3 \frac{dx}{dx} + 4y \left(\frac{dy}{dx} \right) + 17 \left(\frac{dy}{dx} \right) = 0 \frac{dx}{dx}$$

$$\frac{dy}{dx} (3x + 4y + 17) = -12x - 3y$$

$$\frac{dy}{dx} = \frac{-12x - 3y}{3x + 4y + 17}$$

$$\text{At } (-1, 0) \quad \frac{dy}{dx} = \frac{12 - 0}{-3 + 0 + 17} = \frac{12}{14} = \frac{6}{7}$$

$$y = \frac{6}{7}(x + 1)$$

★ Extra practice on chain rule.

Find y' for $y = \frac{2x}{\sqrt{5x-1}}$

$$(5x-1)^{1/2}$$

$$y' = \frac{(5x-1)^{1/2} \cdot 2 - 2x \cdot \frac{1}{2} (5x-1)^{-1/2} \cdot 5}{5x-1}$$

$$= \frac{(5x-1)^{-1/2} [2(5x-1)^{3/2} - 5x]}{5x-1}$$

$$= \frac{5x - 2}{(5x-1)^{3/2}}$$