DATE: _____

Derivatives of Implicit Functions (Extra practice)

Find dy/dx.

1. $3x + y^2 = 4$

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

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

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

2. $4x^3 + y = 5x$

$12x^2 + \frac{dy}{dx} = 5$

$\frac{dy}{dx} = 5 - 12x^2$

3. $4x^3 + y = 5y^2$

$-12x^2 + \frac{dy}{dx} = 10y\frac{dy}{dx}$

$\frac{dy}{dx} - 10y\frac{dy}{dx} = -12x^2$

$\frac{dy}{dx}(1 - 10y) = 12x^2$

$\frac{dy}{dx} = \frac{-12x^2}{1-10y}$

4. $xy + 2x = 7$

$y \cdot 1 + x \cdot \frac{dy}{dx} + 2 = 0$

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

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

5. $4x^2 + 2x + y^3 = 3$

$8x + 2 + 3y^2\frac{dy}{dx} = 0$

$3y^2\frac{dy}{dx} = -8x - 2$

$\frac{dy}{dx} = \frac{-8x-2}{3y^2}$

6. $4x^2 + xy + y^3 = 3$

$8x + y \cdot 1 + x\frac{dy}{dx} + 3y^2\frac{dy}{dx} = 0$

$x\frac{dy}{dx} + 3y^2\frac{dy}{dx} = -8 - y$

$\frac{dy}{dx}(x + 3y^2) = -8 - y$

$\frac{dy}{dx} = \frac{-8-y}{x+3y^2}$

7. $x^3y + 5x = 2y^2$

$y \cdot 3x^2 + x^3 \cdot \frac{dy}{dx} + 5 = 4y\frac{dy}{dx}$

$x^3\frac{dy}{dx} - 4y\frac{dy}{dx} = -3x^2y - 5$

$\frac{dy}{dx}(x^3 - 4y) = -3x^2y - 5$

$\frac{dy}{dx} = \frac{-3x^2y-5}{x^3-4y}$

Find dy/dx when $x = -2$

1. $5x + 3y^3 = 14$

$5(-2) + 3y^3 = 14$

$-10 + 3y^3 = 14$

$3y^3 = 24$

$\sqrt[3]{y^3} = \sqrt[3]{8}$

$y = 2$

$5 + 9y^2\frac{dy}{dx} = 0$

$5 + 9(2)^2\frac{dy}{dx} = 0$

$5 + 36\frac{dy}{dx} = 0$

$36\frac{dy}{dx} = -5$

$\left.\frac{dy}{dx}\right|_{(-2,2)} = \frac{-5}{36}$

2. $xy = 8$

$-2y = 8$

$y = -4$

$y \cdot 1 + x \cdot \frac{dy}{dx} = 0$

$-4 + -2\frac{dy}{dx} = 0$

$-2\frac{dy}{dx} = 4$

$\left.\frac{dy}{dx}\right|_{(-2,-4)} = -2$

3. $4xy - x^2 = 4$

$4(-2)y - (-2)^2 = 4$

$-8y - 4 = 4$

$-8y = 8$

$y = -1$

$y \cdot 4 + 4x\frac{dy}{dx} - 2x = 0$

$-1(4) + 4(-2)\frac{dy}{dx} - 2(-2) = 0$

$-4 - 8\frac{dy}{dx} + 4 = 0$

$-8\frac{dy}{dx} = 0$

$\left.\frac{dy}{dx}\right|_{(-2,-1)} = 0$