3.5 Implicit Differentiation and Derivatives of Log Functions Worksheet

This document was composed and formatted by Annie Bernatchez.

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1) For each problem, use implicit differentiation to find $\frac{dy}{dx}$ in terms of x and y.

a) $2x^3 = 2y^2 + 5$

b) $5y^2 = 2x^3 - 5y$

c) $5x^3 = -3xy + 2$

d) $2x^3 = (3xy + 1)^2$

e) $x^3 - 3x^2y + 4xy^2 = 12$

f) $4\sin(2y)\cos x = 2$

g) $y^2 = \frac{x^2 - 4}{x^2 + 4}$

2) Find the equation of the tangent line to $(x + y)^3 = x^3 + y^3$ at the point $(-1, 1)$.

3) Differentiate each of the following with respect to x.

a) $y = \frac{\ln x}{2x + 3}$

b) $f(x) = e^{x^7}$

c) $f(x) = \ln\left(\frac{x^2 + 1}{x^3 - x}\right)$

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d) $y = \log_2(4x^2)$

Answer Key

1) a) $\frac{dy}{dx} = \frac{3x^2}{2y}$ b) $\frac{dy}{dx} = \frac{6x^2}{10y + 5}$ c) $\frac{dy}{dx} = \frac{-y - 5x^2}{x}$ d) $\frac{dy}{dx} = \frac{-3y^2x - y + x^2}{3x^2y + x}$ e) $\frac{dy}{dx} = \frac{6xy - 3x^2 - 4y^2}{8xy - 3x^2}$ f) $\frac{dy}{dx} = \frac{\sin(2y)\sin x}{2\cos(2y)\cos x}$ g) $\frac{dy}{dx} = \frac{8x}{y(x^2 + 4)^2}$

2) $y = -x$

3) a) $y' = \frac{2x + 3 - 2x\ln x}{x(2x + 3)^2}$ b) $f'(x) = 7x^6e^{x^7}$ c) $f'(x) = \frac{2x}{x^2 + 1} - \frac{3x^2 - 1}{x^3 - x}$ d) $y' = \frac{2}{x\ln 2}$

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