

Worksheet 15: Implicit & Logarithmic Differentiation

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WHILE IT'S TECHNICALLY TRUE,
I WISH SHE'D STOP PREFACING
EVERY SENTENCE WITH THAT.

www.xkcd.com

1. If you haven't already, find the following derivatives:

(a) $y = e^{\cot^{-1}(x^2)} + x^3$

(b) $\tan(x - y) = \frac{y}{1+x^2}$

(c) $f(x) = \log_5(xe^x)$

(d) $x \ln(|x|) - x$

(e) $H(y) = \ln\left(\frac{(5y^3+y^2)^2}{\sqrt{y^3+3}}\right)$

2. Use implicit differentiation to find an equation of the tangent line to the curve $\sin(x + y) = 2x - 2y$ at the point (π, π) .

3. Use logarithmic differentiation to find the derivative of $y = \frac{x^{\frac{3}{2}} \sqrt{x^4+2}}{(4x+1)^5}$

4. Find the derivative of $y = \sqrt{x}^x$.

5. Find the derivative of $y = \sin(x)^{\ln(x)}$.

6. (★) Give an example of y as a function of x . Now give a function which has an implicit relationship between x and y . Can you solve your second function for y (i.e. make it explicit)? Is it always possible to do so?

7. True or False; if false, provide a counterexample. If true, provide a true generalization.

If P is a degree 6 polynomial, then $\frac{d^7}{dx^7}[P] = 0$.