Implicit differentiation

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1. Explain why $\frac{d}{dx}y^2 = 2y\frac{dy}{dx}$ and not just 2y.

Use implicit differentiation to find $\frac{dy}{dx}$:

2.
$$e^{xy} = 2y$$
 3. $(xy+1)^3 = x - y^2 + 8$ 4. $\cos(y^2) + x = e^y$

- 5. Suppose f is an invertible function. Let $y = f^{-1}(x)$. We will derive a formula for $\frac{dy}{dx} = (f^{-1})'(x)$, i.e., the derivative of f^{-1} .
 - (a) If $y = f^{-1}(x)$, what is a formula for x in terms of y?
 - (b) Apply implicit differentiation to your formula from (a), i.e., differentiate both sides with respect to x.
 - (c) Solve for $\frac{dy}{dx}$ and you are done!

6. Let
$$f(x) = e^x$$
.

- (a) What is $f^{-1}(x)$?
- (b) Use your answer from problem 5 to find $(f^{-1})'(x)$.

Some more practice, in case you finish early:

7.
$$\sqrt{x^4 + y^2} = 5x + 2y^3$$
 8. $y = \frac{x+1}{y-1}$ 9. $\sin(xy) = x + y$