WORKSHEET: IMPLICIT DIFFERENTIATION 2

Names and student IDs: _____

Recall the chain rule: If g is differentiable at x and f is differentiable at $g(x)$, and if $h(x) = f(g(x))$ for all x (in a suitable open interval), then

$$h'(x) = f'(g(x)) \cdot g'(x).$$

Further reminders: in implicit differentiation problems, y (or some other variable) is implicitly a function of x (or some other variable). So, for example, $\frac{d}{dx}\big(y^3\big) = 3y^2\frac{dy}{dx}$, not zero (and certainly not ~~$3y^2$~~—that is **never** right).

Also, $\frac{dy}{dx}(x^2y + y^6)$ means the product of $\frac{dy}{dx}$ and $x^2y + y^6$. It does **not** mean the derivative of $x^2y + y^6$ with respect to x. That is correctly written $\frac{d}{dx}\big(x^2y + y^6\big)$. Getting this wrong is a serious error.

You will use implicit differentiation to find $\frac{dy}{dx}$ when $y^7 = \tan(3x - y) + \pi^3$. You **must** solve for $\frac{dy}{dx}$.

1. Rewrite the formula with y written as a function of x.

2. There are two places you will need the chain rule. What are they?

3. Carry out the implicit differentiation. (You will solve for $\frac{dy}{dx}$ in Problem 4.)

4. In the result of Problem 3, solve for $y'(x)$ or $\frac{dy}{dx}$ (depending on which notation you used).

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