# Multivariable Calculus: Tutorial 8

Logan Pachulski

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# Progress Update

Over the past week I have learned about:

1. Completed exam 2.

# Example Problem (Statement)

**Problem:** Suppose that $x^2 + y^3 - z^4 = 1$ and $z^3 + zx + xy = 3$. Take the total differential of each of these equations; suppose these two surfaces intersect in a curve along y which is a function of x. Find $\frac{dy}{dx}$ at $(1, 1, 1)$

## Example Problem (Solution)

We see by taking partial derivatives of each side that

$$2x dx + 3y^2 dy - 4z^3 dz = 0 \tag{1}$$

$$(z + y)dx + xdy + (3z^2 + x)dz = 0 \tag{2}$$

and we can plug in the point (1,1,1) and ad the equations d

$$2dx + 3dy - 4dz = 0 \tag{3}$$

$$2dx + dy + 4dz = 0 \tag{4}$$

$$dy = -dx \implies \frac{dy}{dx} = -1 \tag{5}$$