Eddie Price **Quiz 11 Solutions** **Spring 2017**

High score: 10; Non-0 Low score: 5; Average score: 8.33 (including 0's)

Problem 2 (10 Points). Find the partial derivative $\frac{\partial z}{\partial x}$ for $z = \sin(xy) + \ln(x^2y^2 + 2xy^2 + 3)$

Solution. Here, we treat x as the variable and y as a constant.

Here,

$$\frac{\partial}{\partial x}\left(\sin(xy)\right) = \cos(xy) \cdot \frac{\partial}{\partial x}\left(xy\right) = \cos(xy) \cdot y = y\cos(xy)$$

by the chain rule. And

$$\frac{\partial}{\partial x}\left(\ln\left(x^2y^2 + 2xy^2 + 3\right)\right) = \frac{1}{x^2y^2 + 2xy^2 + 3} \cdot \frac{\partial}{\partial x}\left(x^2y^2 + 2xy^2 + 3\right)$$

$$= \frac{1}{x^2y^2 + 2xy^2 + 3} \cdot \left(2xy^2 + 2y^2 + 0\right) = \frac{2xy^2 + 2y^2}{x^2y^2 + 2xy^2 + 3}$$

by the chain rule. These are true because we treat y as a constant. Thus, we get

$$\frac{\partial z}{\partial x} = \boxed{y\cos(xy) + \frac{2xy^2 + 2y^2}{x^2y^2 + 2xy^2 + 3}}$$

Common Mistakes

Many people canceled a term in the numerator and a term in the denominator, which you cannot do. You can only cancel factors (just multiplication and division).

Many people got the wrong sign for the derivative of $\sin(xy)$, saying it is negative, when it is actually positive.