Exercise 3
Deep Learning

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1. If $z = x^2 + y^2$ and $x = 2cos(t)$ and $y = 2sin(t)$ then compute $\frac{dz}{dt}$ at $t = \pi$.
2. What is the gradient of the function $f(x_1, x_2) = x_1^2 + x_2^2$ at $(1, 2)$?
3. In which direction we have maximum directional derivative for the function $f(x_1, x_2) = x_1x_2 + x_2^3$ at $(2, 3)$?
4. Compute the Jacobian of the $f(x_1, x_2, x_3) = (x1x2, x_1^2 + x_2^2 + x_3^2)$ at $(1, 2, 1)$.
5. Let $\sigma(z) = \frac{1}{1+e^{-z}}$, calculate $\sigma'(z)$ with respect to $\sigma(z)$.(you need to show all the steps of calculations!)
6. Let $\tanh(z) = \frac{e^z - e^{-z}}{e^z + e^{-z}}$, calculate $\tanh'(z)$ with respect to $\tanh(z)$. (you need to show all the steps of calculations!)