Problem 1

Let $w = f(x, y)$ and $x = r\cos(\theta)$ and $y = r\sin(\theta)$.

a) Find $\dfrac{\partial w}{\partial r}$.

b) Find $\dfrac{\partial w}{\partial \theta}$.

Problem 2

Let $f(x, y) = \ln(x^2 + y^2)$ and suppose $x = e^t$ and $y = t^2 + t + 1$. Find $\dfrac{df}{dt}$.

Problem 3

Suppose that $w = f(u, v, x, y)$ and $u = g(\alpha, \beta)$, $v = h(\alpha, \beta)$, $x = k(\alpha, \beta)$, $y = l(\alpha, \beta)$. Find $\dfrac{\partial w}{\partial \alpha}$ and $\dfrac{\partial w}{\partial \beta}$.