Problems: Chain Rule Practice

One application of the chain rule is to problems in which you are given a function of x and y with inputs in polar coordinates. For example, let $w = (x^2 + y^2)xy$, $x = r\cos\theta$ and $y = r\sin\theta$.

1. Use the chain rule to find $\dfrac{\partial w}{\partial r}$.

2. Find the total differential dw in terms of dr and $d\theta$.

3. Find $\dfrac{\partial w}{\partial r}$ at the point $(r, \theta) = (2, \pi/4)$.

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