14.4, number 1: **Consider $w = x^2 + y^2$, $x = \cos t$, and $y = \sin t$.**

(a) **Use the chain rule to calculate $\frac{dw}{dt}$.**

(b) **First write w as a function of t directly, then compute $\frac{dw}{dt}$ using first semester calculus techniques.**

(c) **Evaluate $\frac{dw}{dt}(\pi)$.**

Answer:

(a) There is a tree on the next page which tells me that

$$\begin{aligned}\frac{dw}{dt} &= \frac{\partial w}{\partial x}\frac{dx}{dt} + \frac{\partial w}{\partial y}\frac{dy}{dt} = 2x(-\sin t) + 2y(\cos t) \\ &= 2(\cos t)(-\sin t) + 2\sin t(\cos t) = \boxed{0}.\end{aligned}$$

(b) We see that $w = x^2 + y^2 = \cos^2 t + \sin^2 t = 1$. It follows that $\frac{dw}{dt} = \boxed{0}$.

(c) $\boxed{\frac{dw}{dt}(\pi) = 0}$.

Picture 14.4 Number 1