Answer on Question #51998 – Math – Multivariable Calculus

Find dt dw at 2 p t = , where

w = x2 + y2 + 2x + 3y, x =cos t, y =sin t

Solution

Method 1

$$\frac{\theta w}{\partial x} = \frac{\partial}{\partial x}(x^2 + y^2 + 2x + 3y) = 2x + 2,$$

$$\frac{\partial w}{\partial y} = \frac{\partial}{\partial y}(x^2 + y^2 + 2x + 3y) = 2y + 3,$$

$$\frac{dx}{dt} = (cos(t))' = -sin(t),$$

$$\frac{dy}{dt} = (sin(t))' = cos(t),$$

$$\frac{dw}{dt} = \frac{\partial w}{\partial x} \cdot \frac{dx}{dt} + \frac{\partial w}{\partial y} \cdot \frac{dy}{dt} = (2x + 2) \cdot \big(-sin(t)\big) + (2y + 3) \cdot cos(t) =$$

$$= (2cos(t) + 2) \cdot \big(-sin(t)\big) + (2sin(t) + 3) \cdot cos(t) =$$

$$= -2sin(t) + 3cos(t).$$

If $t = p^2$, then $\frac{dw}{dt} = -2sin(p^2) + 3cos(p^2)$.

Method 2

$$w = x^2 + y^2 + 2x + 3y = cos^2 t + sin^2 t + 2cost + 3sint$$
$$= 2cost + 3sint + 1;$$

$$\frac{dw}{dt} = -2sint + 3cost;$$

If $t = p^2$, then $\frac{dw}{dt} = -2sin(p^2) + 3cos(p^2)$.