1–6 Use the Chain Rule to find dz/dt or dw/dt.

$$\frac{d}{dx}\left[\arctan(x)\right] = \frac{1}{x^2+1}.$$

4. $z = \tan^{-1}(y/x), \quad x = e^t, \quad y = 1 - e^{-t}$

7–12 Use the Chain Rule to find $\partial z/\partial s$ and $\partial z/\partial t$.

7. $z = x^2y^3, \quad x = s\cos t, \quad y = s\sin t$

21–26 Use the Chain Rule to find the indicated partial derivatives.

21. $z = x^2 + xy^3, \quad x = uv^2 + w^3, \quad y = u + ve^w;$

$\frac{\partial z}{\partial u}, \frac{\partial z}{\partial v}, \frac{\partial z}{\partial w}$ when $u = 2, v = 1, w = 0$ #21 NA

25. $u = x^2 + yz, \quad x = pr\cos\theta, \quad y = pr\sin\theta, \quad z = p + r;$

$\frac{\partial u}{\partial p}, \frac{\partial u}{\partial r}, \frac{\partial u}{\partial \theta}$ when $p = 2, r = 3, \theta = 0$

27–30 Use Equation 6 to find dy/dx.

27. $\sqrt{xy} = 1 + x^2y$ #27 NA

28. $y^5 + x^2y^3 = 1 + ye^{x^2}$

6 $$\frac{dy}{dx} = -\frac{\frac{\partial F}{\partial x}}{\frac{\partial F}{\partial y}} = -\frac{F_x}{F_y}$$

31–34 Use Equations 7 to find $\partial z/\partial x$ and $\partial z/\partial y$. #31 NA

31. $x^2 + y^2 + z^2 = 3xyz$

32. $xyz = \cos(x + y + z)$

45–48 Assume that all the given functions are differentiable.

45. If $z = f(x, y)$, where $x = r\cos\theta$ and $y = r\sin\theta$, (a) find $\partial z/\partial r$ and $\partial z/\partial\theta$ and (b) show that

$$\left(\frac{\partial z}{\partial x}\right)^2 + \left(\frac{\partial z}{\partial y}\right)^2 = \left(\frac{\partial z}{\partial r}\right)^2 + \frac{1}{r^2}\left(\frac{\partial z}{\partial \theta}\right)^2$$

48. If $z = f(x, y)$, where $x = s + t$ and $y = s - t$, show that

$$\left(\frac{\partial z}{\partial x}\right)^2 - \left(\frac{\partial z}{\partial y}\right)^2 = \frac{\partial z}{\partial s}\frac{\partial z}{\partial t}$$