(1)

$$f(x) = \cos(x)\cosh(x)$$
$$\frac{d[f(x)]}{dx} = -\sin(x)\cosh(x) + \cos(x)\sinh(x)$$

(2)

$$g(t) = \arcsin(t)\sin(t)$$
$$\frac{d[g(t)]}{dt} = \arcsin(t)\cos(t) + \sin(t)\frac{d}{dt}\arcsin(t)$$

(3)

$$f(x,y,z) = -z^2(x-2y) - 3z + \log\left(\frac{x}{2y}\right)$$
$$\nabla f(x,y,z) = \begin{bmatrix} -z^2 + \frac{1}{x} \\ 2z^2 - \frac{1}{y} \\ -2z(x-2y) - 3 \end{bmatrix}$$

(4)

$$g(x,y) = \sin(x)\cos(y)$$
$$\nabla g(x,y) = \begin{bmatrix} \cos(x)\cos(y) \\ -\sin(x)\sin(y) \end{bmatrix}$$