

(1)

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

(2)

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

(3)

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

(4)

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