

9장 연습문제

1.

(a) $2\sqrt{2}$

(b) 10

(c) $2 - e$

(d) $-\frac{1}{2}$

3.

(a) $\frac{\partial z}{\partial x} = \frac{1}{2\sqrt{x}}, \quad \frac{\partial z}{\partial y} = -\frac{1}{3\sqrt[3]{y^2}}$

(b) $\frac{\partial z}{\partial x} = 1 + 2xy^3, \quad \frac{\partial z}{\partial y} = 3x^2y^2 + 4y^3$

(c) $\frac{\partial z}{\partial x} = \frac{2x}{y^4}, \quad \frac{\partial z}{\partial y} = -\frac{4x^2}{y^5}$

(d) $\frac{\partial z}{\partial x} = \frac{1}{xe^y}, \quad \frac{\partial z}{\partial y} = -\frac{\ln x}{e^y}$

5.

(a) $\frac{\partial z}{\partial x} = -6xy^3 \sin(3x^2y^3), \quad \frac{\partial z}{\partial y} = -9x^2y^2 \sin(3x^2y^3)$

(b) $\frac{\partial z}{\partial x} = 2xy^3e^{x^2y^3}, \quad \frac{\partial z}{\partial y} = 3x^2y^2e^{x^2y^3}$

(c) $\frac{\partial z}{\partial x} = \frac{2x \sin y}{x^2 \sin y} = \frac{2}{x}, \quad \frac{\partial z}{\partial y} = \frac{x^2 \cos y}{x^2 \sin y} = \frac{\cos y}{\sin y}$

(d) $\frac{\partial z}{\partial x} = 72x^3(3x^4 - 2y^5)^5, \quad \frac{\partial z}{\partial y} = -60y^4(3x^4 - 2y^5)^5$

7.

(a) $f_{xxx} = 8e^{2x} \cos 3y$

(b) $f_{yxy} = -18e^{2x} \cos 3y$

(c) $f_{xxyy} = -36e^{2x} \cos 3y$

(d) $f_{yxxy} = -36e^{2x} \cos 3y$

9.

(a) $\frac{dz}{dt} = 3e^{3t} - 2 \sin t \cos t$

(b) $\frac{dz}{dt} = \frac{6t^5}{\tan^3 t} - \frac{3t^6 \sec^2 t}{\tan^4 t}$

11.

$$(a) \int_1^2 \int_{-3}^0 (xy + 2y) dx dy = \int_1^2 \left(\frac{3}{2}y\right) dy = \frac{9}{4}$$

$$(b) \int_0^1 \int_{-1}^2 (3x^2 + y) dy dx = \int_0^1 \left(9x^2 + \frac{3}{2}\right) dx = \frac{9}{2}$$

$$(c) \int_{-1}^0 \int_{-1}^0 (\sin x + \cos y) dx dy = \int_{-1}^0 (-1 + \cos 1 + \cos y) dy = \sin 1 + \cos 1 - 1$$

$$(d) \int_0^3 \int_{-1}^1 e^x dy dx = \int_0^3 2e^x dx = 2(e^3 - 1)$$

13.

이상기체 상태방정식은 $P = \frac{8.31 T}{V}$ 이다. 연쇄법칙에 의하여

$$\begin{aligned} \frac{dP}{dt} &= \frac{\partial P}{\partial T} \cdot \frac{dT}{dt} + \frac{\partial P}{\partial V} \cdot \frac{dV}{dt} \\ &= \frac{8.31}{V} \cdot \frac{dT}{dt} - \frac{8.31 T}{V^2} \cdot \frac{dV}{dt} \\ &= -0.03324 \end{aligned}$$

이다.