

[Chapter 09] 연습문제 정답

9.1

[풀이]

$$\therefore \mathbf{a} = [\sqrt{2}a, a, -a], |\mathbf{a}| = 2a$$

9.2

[풀이]

$$\therefore \mathbf{a} = [2, 2, 2], |\mathbf{a}| = 2\sqrt{3}$$

9.3

[풀이]

$$\therefore \mathbf{a} = [-2, 4, 2], |\mathbf{a}| = 2\sqrt{6}$$

9.4

[풀이]

$$\therefore \mathbf{a} = [-2a, -2b, 0], |\mathbf{a}| = 2\sqrt{a^2 + b^2}$$

9.5

[풀이]

$$\therefore [1, 9, 4], [1, 9, 4]$$

9.6

[풀이]

$$\therefore [1, 9, 4], [1, 9, 4]$$

9.7

[풀이]

$$\therefore [-7, -3, 7], [-7, -3, 7]$$

9.8

[풀이]

$$\therefore [2, 10, 8], [-2, -10, -8]$$

9.9

[풀이]

$$\therefore -14, 26, -7$$

9.10

[풀이]

$$\therefore 19, -21$$

9.11

[풀이]

$$\therefore -7, -33$$

9.12

[풀이]

$$\therefore -105, -105$$

9.13

[풀이]

$$\therefore \overrightarrow{AB} = \mathbf{u}(\mathbf{a} \cdot \mathbf{u}), \overrightarrow{BC} = \mathbf{a} - \mathbf{u}(\mathbf{a} \cdot \mathbf{u})$$

9.14

[풀이]

증명생략

9.15

[풀이] $\mathbf{a} \times \mathbf{b} = [-9, -7, 4]$

$$\mathbf{b} \times \mathbf{c} = [-7, 7, -28]$$

$$\mathbf{c} \times \mathbf{a} = [8, 0, -16]$$

9.16

[풀이] $\mathbf{a} + \mathbf{b} = [-1, 3, 3]$

$$\mathbf{c} \times (\mathbf{a} + \mathbf{b}) = [15, -7, 12]$$

$$\mathbf{a} \times \mathbf{c} + \mathbf{b} \times \mathbf{c} = [-15, 7, -12]$$

9.17

[풀이] $\mathbf{a} \cdot (\mathbf{b} \times \mathbf{c}) = -56$

$$(\mathbf{a} \times \mathbf{b}) \cdot \mathbf{c} = -56$$

9.18

[풀이]

$$\therefore \mathbf{r}'(1) = 2i + 2j, \mathbf{u}'(1) = \frac{2i + 2j}{2\sqrt{2}} = \frac{i + j}{\sqrt{2}}$$

9.19

[풀이]

$$\therefore \mathbf{r}'(0) = j, \mathbf{u}'(0) = j$$

9.20

[풀이]

$$\therefore \mathbf{r}'(1) = \mathbf{i} + 4\mathbf{j} + 9\mathbf{k}, \quad \mathbf{u}'(1) = \frac{\mathbf{i} + 4\mathbf{j} + 9\mathbf{k}}{7\sqrt{2}}$$

9.21

[풀이]

$$\therefore \mathbf{r}'(\pi/2) = -2\mathbf{j} + 4\mathbf{k}, \quad \mathbf{u}'(\pi/2) = \frac{-\mathbf{j} + 2\mathbf{k}}{\sqrt{5}}$$

9.22

[풀이]

$$\sqrt{5}\pi$$

9.23

[풀이]

$$\frac{\pi^2}{2}$$

9.24

[풀이]

$$6$$

9.25

[풀이]

$$\therefore \nabla f = 8x\mathbf{i} + 2y\mathbf{j}$$

9.26

[풀이]

$$\therefore \nabla f = \frac{x}{\sqrt{x^2 + y^2 + z^2}}\mathbf{i} + \frac{y}{\sqrt{x^2 + y^2 + z^2}}\mathbf{j} + \frac{z}{\sqrt{x^2 + y^2 + z^2}}\mathbf{k}$$

9.27

[풀이]

$$\therefore \nabla f = e^x \sin y \mathbf{i} + e^x \cos y \mathbf{j}$$

9.28

[풀이]

$$\therefore \nabla f = 3(x + y + z)^2(\mathbf{i} + \mathbf{j} + \mathbf{k})$$

9.29

[풀이]

$$\therefore \mathbf{n} = \frac{-2\sqrt{5}}{5}\mathbf{i} + \frac{\sqrt{5}}{5}\mathbf{j}$$

9.30

[풀이]

$$\therefore \mathbf{n} = \frac{\sqrt{2}}{2}(\mathbf{i} + \mathbf{j})$$

9.31

[풀이]

$$\therefore \mathbf{n} = \frac{1}{\sqrt{2}}\left(-\frac{3}{5}\mathbf{i} - \frac{4}{5}\mathbf{j} + \mathbf{k}\right)$$

9.32

[풀이]

$$\therefore \mathbf{n} = \frac{\mathbf{i} + \mathbf{j} + \mathbf{k}}{\sqrt{3}}$$

9.33

[풀이]

$$\operatorname{div} \mathbf{v} = a + b + c$$

9.34

[풀이]

$$\operatorname{div} \mathbf{v} = 3(x^2 + y^2 + z^2)$$

9.35

[풀이]

$$\operatorname{div} \mathbf{v} = 0$$

9.36

[풀이]

$$\operatorname{div} \mathbf{v} = 0$$

9.37

[풀이]

$$0$$

9.38

[풀이]

$$- \mathbf{j} + x \mathbf{k}$$

9.39

[풀이]

$$-(ye^{-xy} + xe^{xy})k$$

9.40

[풀이]

$$0$$