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#3. 직교좌표 (2, -1, 3)

$$\Rightarrow \rho = \sqrt{x^2 + y^2 + z^2} = \sqrt{14}$$

$$\tan \theta = \frac{y}{x} = -\frac{1}{2} \quad \cos \phi = \frac{z}{\rho} = \frac{3}{\sqrt{14}}$$

$$\text{구면좌표 } P(\rho, \theta, \phi) = \left(\sqrt{14}, \tan^{-1}\left(-\frac{1}{2}\right), \cos^{-1}\left(\frac{3}{\sqrt{14}}\right) \right)$$

$$r = \sqrt{x^2 + y^2} = \sqrt{5} \quad z = 3$$

$$\tan \theta = \frac{y}{x} = -\frac{1}{2}$$

$$\text{원주좌표 } P(r, \theta, z) = \left(\sqrt{5}, \tan^{-1}\left(-\frac{1}{2}\right), 3 \right)$$

#6. $x^2 + y^2 = 4, \quad z = -2$

$$r = \sqrt{x^2 + y^2} = \pm 2$$

 $\Rightarrow z = -2$ 에 위치함 반지름 2 인 원
#10. $r = 3, \quad z = 20$
 \Rightarrow 반지름 3의 원기둥을 따라 도는 나선
#13. $\rho = 5, \quad \phi = \frac{\pi}{4}$
 $\Rightarrow z$ 가 $\frac{5}{\sqrt{2}}$, 반지름이 $\frac{5}{\sqrt{2}}$ 인 원

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#5. $a = -2e_1, \quad b = -e_1 + e_2$

$$\Rightarrow a = (-2, 0), \quad b = (-1, 1)$$

$$a \cdot b = -2 + 0 = -2$$

$$(1, 2, 3) \quad b = (-2, 4, 2) \quad c = (2, -3, 1)$$

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$$(abc) = a \cdot (b \times c) = \begin{vmatrix} 1 & 2 & 3 \\ -2 & 4 & 2 \\ 2 & -3 & 1 \end{vmatrix} = 4 + 8 + 18 - 24 + 6 + 4 = 16$$

#13. $(2, -3, 4), (1, 3, -3), (-2, 4, 2)$

$$\Rightarrow \begin{vmatrix} 2 & -3 & 4 \\ 1 & 3 & -3 \\ -2 & 4 & 2 \end{vmatrix} = 12 - 18 + 16 + 24 + 24 + 6 = 64$$

#15. $x + y = 1, \quad 2x - 3y = 1$

$$\Rightarrow \cos \theta = \frac{(-1, 1) \cdot (2, 2)}{\sqrt{1+1} \cdot \sqrt{4+4}} = \frac{-1}{\sqrt{26}} \quad \therefore \theta = \cos^{-1} \left(-\frac{1}{\sqrt{26}} \right)$$