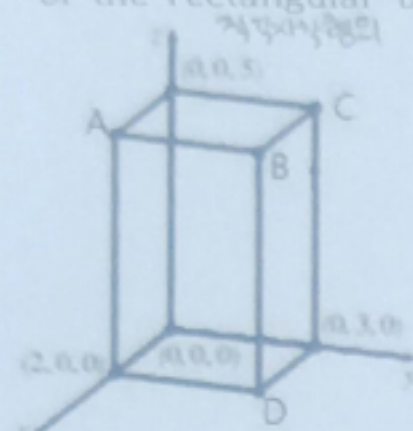


제출 마감일: 2020년 4월 3일 자정까지

제출 방법: '아주Bb/과제출제/제출'에 upload된 과제를 프린트한 후 풀기 => 풀은 과제를 사진 또는 스캔하여 '아주Bb/과제출제/제출'에 upload => 이것으로 동영상강의학습활동 출결 인정

## Section 12.1 3-Dimensional Coordinates Systems

1. (a) Find the coordinates of the vertices  $A, B, C, D$  of the rectangular box shown.



$$\begin{aligned} A & (2, 0, 5) \\ B & (2, 3, 5) \\ C & (0, 3, 5) \\ D & (2, 3, 0) \end{aligned}$$

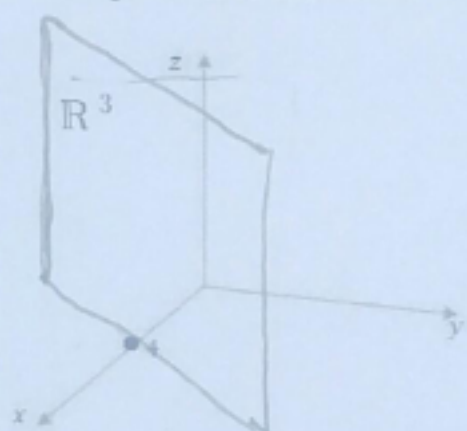
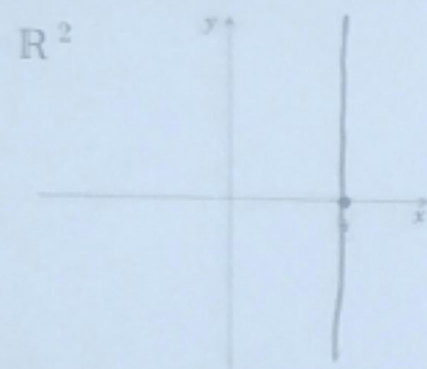
- (b) The distance between the point  $(2, 0, 0)$  and the point  $C$  is  $\sqrt{38}$   
 $\sqrt{2^2 + 3^2 + 5^2} = \sqrt{38}$

2. Find the distance from the point  $P(-2, 1, 7)$  to the point  $Q(1, 3, -5)$ .

$$|PQ| = \sqrt{3^2 + 2^2 + 12^2} = \sqrt{167}$$

3. What does the equation  $x=4$  represent in  $R^2$ ?

What does the equation  $x=4$  represent in  $R^3$ ?  
 Illustrate with sketches.



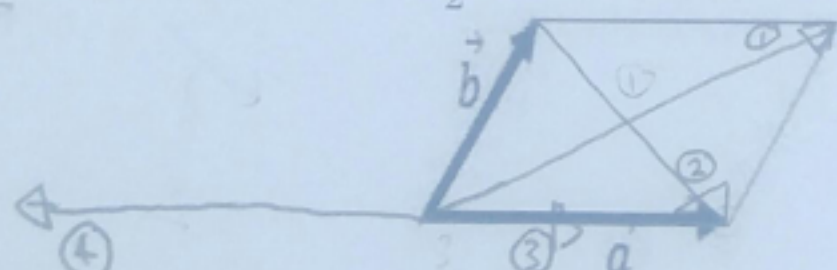
4. Find an equation of the sphere with center  $(1, 4, -3)$  and radius 5. (식을 정리하지 않아도 됨)

$$(x-1)^2 + (y-4)^2 + (z+3)^2 = 25$$

## Section 12.2 Vectors

1. Draw the following vectors in the parallelogram shown.

1)  $\vec{a} + \vec{b}$     2)  $\vec{a} - \vec{b}$     3)  $\frac{1}{2}\vec{a}$     4)  $-2\vec{a}$



2. If two points are given  $A(0, 3, 1)$  and  $B(2, 3, -1)$ , then  $\vec{AB} = \langle 2, 0, -2 \rangle$ .

3. Find the vector  $\vec{v}$  that has the same direction  $\vec{a} = \langle 8, 1, -4 \rangle$ , but has length 4.

$$\begin{aligned} \vec{v} &= \langle 8x, x, -4x \rangle \\ 64x^2 + x^2 + 16x^2 &= 16 \\ 81x^2 &= 16 \\ x &= \frac{4}{9} \\ \vec{v} &= \left\langle \frac{32}{9}, \frac{4}{9}, -\frac{16}{9} \right\rangle \end{aligned}$$

4. Let  $\vec{a} = 4\mathbf{i} - 3\mathbf{j} + 2\mathbf{k}$  and  $\vec{b} = 2\mathbf{i} - 4\mathbf{k}$ .  
 Then,  $\vec{a} = \langle 4, -3, 2 \rangle$  and  $\vec{b} = \langle 2, 0, -4 \rangle$ .

Find the following:

- 1)  $\vec{a} + \vec{b} = \langle 6, -3, -2 \rangle$      $4\mathbf{a} = 16, -12, 8$   
 2)  $4\vec{a} - 2\vec{b} = \langle 12, -12, 16 \rangle$      $2\mathbf{b} = 4, 0, -8$   
 3)  $|\vec{a}| = \sqrt{29}$     4)  $|\vec{a} - \vec{b}| = 7$      $\mathbf{a} - \mathbf{b} = 2, -3, 6$   
 5) The unit vector  $\vec{u}$  that has the same direction as the vector  $\vec{a}$  is  $\vec{u} = \left\langle \frac{4}{\sqrt{29}}, \frac{-3}{\sqrt{29}}, \frac{2}{\sqrt{29}} \right\rangle$

## Section 12.3 Dot Product

1. Let  $\vec{a} = \langle 4, 3, -2 \rangle$ ,  $\vec{b} = \langle 2, -1, 1 \rangle$ . Then

- 1)  $\vec{a} \cdot \vec{b} = 8 - 3 - 2 = 3$   
 2) Find the angle  $\theta$  between the vectors  $\vec{a}$  and  $\vec{b}$ .  
 $|\mathbf{a}| = \sqrt{29}$      $|\mathbf{b}| = \sqrt{6}$      $\cos \theta = \frac{11}{\sqrt{29} \times \sqrt{6}}$      $\theta = 33.5^\circ$

2. Find the values of  $x$  such that the angle between the vectors  $\langle 2, 1, -1 \rangle$  and  $\langle 1, x, 0 \rangle$  is  $45^\circ$ .

$$\begin{aligned} 2 + x &= \sqrt{6} \times \sqrt{1+x^2} \times \frac{\sqrt{2}}{2} \\ 4 + 2x &= \sqrt{12+12x^2} \\ 16 + 16x + 4x^2 &= 12 + 12x^2 \\ 4 + 4x &= 3 + 2x^2 \\ 2x^2 - 4x - 1 &= 0 \end{aligned}$$

3. Let  $\vec{a} = \langle -1, 4, 8 \rangle$ ,  $\vec{b} = \langle 12, 1, 2 \rangle$ . Then

- (a) the scalar projection of  $\vec{b}$  onto  $\vec{a}$  is  $\frac{8}{9}$   
 $\mathbf{a} \cdot \mathbf{b} = -12 + 4 + 16 = 8$      $\text{comp}_{\vec{a}} \vec{b} = \frac{8}{9}$

- (b) the vector projection of  $\vec{b}$  onto  $\vec{a}$  is  $\frac{8}{9} \times \frac{1}{9} \times \vec{a}$      $\text{proj}_{\vec{a}} \vec{b} = \left\langle -\frac{8}{81}, \frac{32}{81}, \frac{64}{81} \right\rangle$

4. Find the work done by a force  $\vec{F} = \langle 8, -6, 9 \rangle$  that an object from the point  $P(0, 10, 8)$  to the point  $Q(6, 12, 20)$  along a straight line.

$$\begin{aligned} \vec{PQ} &= \langle 6, 2, 12 \rangle \\ 48 - 12 + 108 &= 144 \end{aligned}$$

5. Find the acute angle between the lines  $x + 2y = 7$  and  $5x - y = 7$ .

$$\begin{aligned} y &= \frac{-x+7}{2} \\ y &= 5x-7 \\ \tan(\theta) &= -\frac{1}{2} \\ \tan(\theta) &= 5 \end{aligned}$$