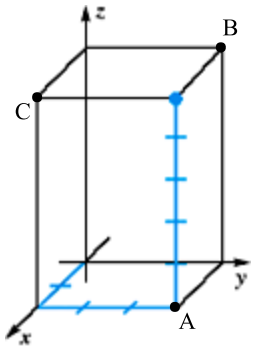
Student: Phong Vo **Date:** 02/06/18	**Instructor:** Chuck Ormsby **Course:** Multi-Variable and Vector Calculus -- Calculus III Spring 2018	**Assignment:** Section 12.2 Homework

1. Find the coordinates of the vertices A, B, and C of the following rectangular box. The blue point in the figure is the point (4,6,10).



The coordinates of point A are (4 , 6 , 0).
(Simplify your answers.)

The coordinates of point B are (0 , 6 , 10).
(Simplify your answers.)

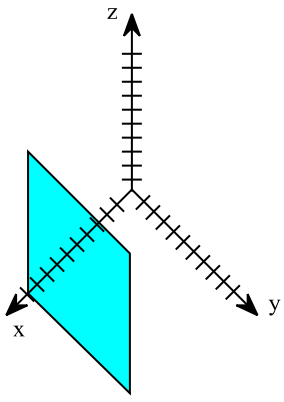
The coordinates of point C are (4 , 0 , 10).
(Simplify your answers.)

2. Sketch the following plane in the window $[0,10]\times[0,10]\times[0,10]$.

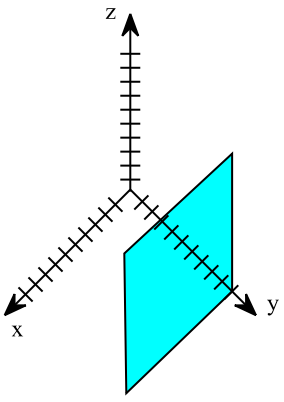
$x = 10$

Choose the correct graph below.

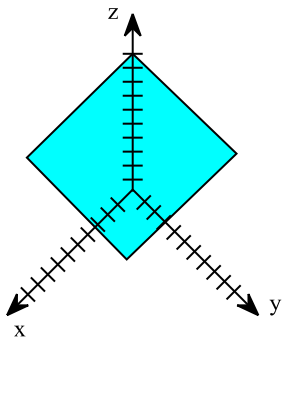
A.



B.



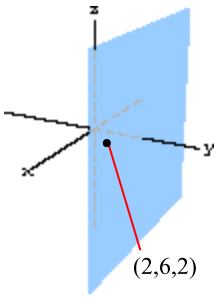
C.



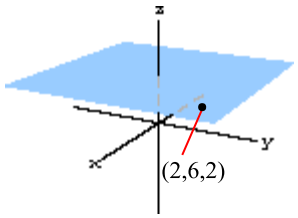
3. Sketch the plane parallel to the xy-plane through (2,6,2) and find its equation.

Sketch the plane parallel to the xy-plane through (2,6,2). Choose the correct graph below.

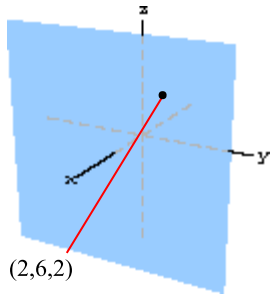
A.



B.



C.



What is the equation of the plane parallel to the xy-plane through (2,6,2)?

- **A.** $z = 2$
- **B.** $2x + 6y + 2z = 0$
- **C.** $x = 2$
- **D.** $y = 6$

4. Find an equation or inequality that describes the following object.

A ball with center $(-1,4,8)$ and radius 3.

Choose the correct answer below.

- **A.** $(x+1)^2 + (y-4)^2 + (z-8)^2 \le 9$
- **B.** $(x-1)^2 + (y+4)^2 + (z+8)^2 \le 9$
- **C.** $(x+1)^2 + (y-4)^2 + (z-8)^2 = 9$
- **D.** $(x-1)^2 + (y+4)^2 + (z+8)^2 \ge 9$

5. Find the equation of the sphere passing through $P(-6, 7, 8)$ and $Q(8, -1, 9)$ with its center at the midpoint of PQ.

The standard equation of the sphere is $(x-1)^2 + (y-3)^2 + \left(z - \frac{17}{2}\right)^2 = \frac{261}{4}$.

(Simplify your answer.)

6. Give a geometric description of the following set of points.

$x^2 + y^2 + z^2 - 12x + 6y - 16z + 93 = 0$

Select the correct choice below and fill in the answer boxes within your choice.

(Simplify your answers.)

- **A.** A ball centered at (, ,) with radius
- **B.** The exterior of a ball centered at (, ,) with radius
- **C.** A sphere centered at (6 , −3 , 8) with radius 4

7. Give a geometric description of the following set of points.

$x^2 + y^2 + z^2 - 6x - 16y - 10z \leq 69$

Choose the correct answer below.

- **A.** A ball with center (3,8,5) and radius $\sqrt{167}$
- **B.** A ball with center $(-3,-8,-5)$ and radius $\sqrt{167}$
- **C.** A ball with center (3,8,5) and radius 167
- **D.** A ball with center $(-3,-8,-5)$ and radius 167
- **E.** The entire xyz-coordinate system
- **F.** The empty xyz-coordinate system

8. For the vectors $\mathbf{u} = \langle 3, 1, 2 \rangle$ and $\mathbf{v} = \langle 3, 0, 2 \rangle$, evaluate the following expressions.

a. $3\mathbf{u} + 4\mathbf{v}$ **b.** $4\mathbf{u} - \mathbf{v}$ **c.** $|\mathbf{u} + 3\mathbf{v}|$

a. $3\mathbf{u} + 4\mathbf{v} = \langle 21, 3, 14 \rangle$

b. $4\mathbf{u} - \mathbf{v} = \langle 9, 4, 6 \rangle$

c. $|\mathbf{u} + 3\mathbf{v}| = \sqrt{209}$

(Type an exact answer, using radicals as needed.)

9. For the vectors $\mathbf{u} = \langle 3, 0, 2 \rangle$ and $\mathbf{v} = \langle 0, 2, 1 \rangle$, evaluate the following expressions.

a. $4\mathbf{u} + 2\mathbf{v}$ **b.** $4\mathbf{u} - \mathbf{v}$ **c.** $|\mathbf{u} + 4\mathbf{v}|$

a. $4\mathbf{u} + 2\mathbf{v} = \langle 12, 4, 10 \rangle$

b. $4\mathbf{u} - \mathbf{v} = \langle 12, -2, 7 \rangle$

c. $|\mathbf{u} + 4\mathbf{v}| = \sqrt{109}$

(Type an exact answer, using radicals as needed.)

10. Consider the points P(r,s,t), where r, s, and t are real numbers, and Q(4,7, − 4). Complete parts (a) through (c).

a. Find $\overrightarrow{PQ}$ and state your answer in two forms: $\langle a, b, c\rangle$ and $a\mathbf{i} + b\mathbf{j} + c\mathbf{k}$.

$\overrightarrow{PQ} = \langle\ 4 - r\ ,\ 7 - s\ ,\ -4 - t\ \rangle = (\ 4 - r\ )\mathbf{i} + (\ 7 - s\ )\mathbf{j} + (\ -4 - t\ )\mathbf{k}$

b. Find the magnitude of $\overrightarrow{PQ}$.

The magnitude of $\overrightarrow{PQ}$ is $\sqrt{(4-r)^2 + (7-s)^2 + (t+4)^2}$.

c. Find two unit vectors parallel to $\overrightarrow{PQ}$.

A.

$$\pm\left\langle \frac{4-r}{\sqrt{(4-r)^2+(7-s)^2+(-4-t)^2}}, \frac{7-s}{\sqrt{(4-r)^2+(7-s)^2+(-4-t)^2}}, \frac{-4-t}{\sqrt{(4-r)^2+(7-s)^2+(-4-t)^2}} \right\rangle$$

B.

$$\pm\left\langle \frac{4}{\sqrt{(7-s)^2+(-4-t)^2}}, \frac{7}{\sqrt{(4-r)^2+(-4-t)^2}}, \frac{-4}{\sqrt{(4-r)^2+(7-s)^2}} \right\rangle$$

C.

$$\pm\left\langle \frac{(4-r)^2}{\sqrt{(4-r)^2+(7-s)^2+(-4-t)^2}}, \frac{(7-s)^2}{\sqrt{(4-r)^2+(7-s)^2+(-4-t)^2}}, \frac{(-4-t)^2}{\sqrt{(4-r)^2+(7-s)^2+(-4-t)^2}} \right\rangle$$

D.

$$\pm\left\langle \frac{1}{\sqrt{(7-s)^2+(-4-t)^2}}, \frac{1}{\sqrt{(4-r)^2+(-4-t)^2}}, \frac{1}{\sqrt{(4-r)^2+(7-s)^2}} \right\rangle$$

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11. Find two vectors parallel to **v** of the given length.

v = $\langle 4, -3, 0\rangle$; length = 20

The vector in the direction of **v** is $\langle\ 16\ ,\ -12\ ,\ 0\ \rangle$.

The vector in the opposite direction of **v** is $\langle\ -16\ ,\ 12\ ,\ 0\ \rangle$.

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12. Determine the values of x and y such that the points (1,2,3), (7,5,1), and (x,y,2) are collinear (lie on a line).

x = 4 and y = 3.5
(Type integers or decimals.)