

Topic: Describing a region in three dimensional space

Question: Describe the surface in three-dimensional space.

$$x + y = 1$$

Answer choices:

- A A horizontal plane that's parallel to the z -axis and intersects the xy -plane in the line $x + y = 1$.
- B A horizontal plane that's perpendicular to the z -axis and intersects the xy -plane in the line $x + y = 1$.
- C A vertical plane that's perpendicular to the z -axis and intersects the xy -plane in the line $x + y = 1$.
- D A vertical plane that's parallel to the z -axis and intersects the xy -plane in the line $x + y = 1$.



Solution: D

The first thing we can see with our region $x + y = 1$ is that there's no z element. This means that our region has no intersection with the z -axis which means that our region is a plane that's parallel to the z -axis. Next we can solve for the x - and y -intercepts.

The x -intercept occurs where $y = 0$.

$$x + (0) = 1$$

$$x = 1$$

The x -intercept occurs at the point $(1,0,0)$.

The y -intercept occurs where $x = 0$.

$$(0) + y = 1$$

$$y = 1$$

The y -intercept occurs at the point $(0,1,0)$.

These two points show that the xy -plane is intersected in R^3 along the line $x + y = 1$.

Pulling together all of this information we can see that the surface in R^3 of $x + y = 1$ is a vertical plane that's parallel to the z -axis and intersects the xy -plane in the line $x + y = 1$.



Topic: Describing a region in three dimensional space

Question: Describe the surface in three-dimensional space.

$$x + z = 4$$

Answer choices:

- A A plane that's parallel to the y -axis and intersects the xz -plane in the line $x + z = 4$.
- B A plane that's parallel to the z -axis and intersects the xy -plane in the line $x + z = 4$.
- C A plane that's parallel to the x -axis and intersects the xz -plane in the line $x + z = 4$.
- D A plane that's parallel to the x -axis and intersects the yz -plane in the line $x + z = 4$.



Solution: A

The first thing we can see with our region $x + z = 4$ is that there's no y element. This means that our region has no intersection with the y -axis which means that our region is a plane that's parallel to the y -axis. Next we can solve for the x - and z -intercepts.

The x -intercept occurs where $z = 0$.

$$x + (0) = 4$$

$$x = 4$$

The x -intercept occurs at the point $(4,0,0)$.

The z -intercept occurs where $x = 0$.

$$(0) + z = 4$$

$$z = 4$$

The y -intercept occurs at the point $(0,0,4)$.

These two points show that the xz -plane is intersected in R^3 along the line $x + z = 4$.

Pulling together all of this information we can see that the surface in R^3 of $x + z = 4$ is a plane that is parallel to the y -axis and intersects the xz -plane in the line $x + z = 4$.



Topic: Describing a region in three dimensional space

Question: Describe the surface in three-dimensional space.

$$2y + z = -6$$

Answer choices:

- A A horizontal plane that's parallel to the z -axis and intersects the xy -plane in the line $2y + z = -6$.
- B A plane that's parallel to the x -axis and intersects the yz -plane in the line $2y + z = -6$.
- C A vertical plane that's parallel to the x -axis and intersects the xy -plane in the line $2y + z = -6$.
- D A plane that's parallel to the y -axis and intersects the xz -plane in the line $2y + z = -6$.



Solution: B

The first thing we can see with our region $2y + z = -6$ is that there's no x element. This means that our region has no intersection with the x -axis which means that our region is a plane that's parallel to the x -axis. Next we can solve for the y - and z -intercepts.

The y -intercept occurs where $z = 0$.

$$2y + (0) = -6$$

$$y = -3$$

The x -intercept occurs at the point $(0, -3, 0)$.

The z -intercept occurs where $y = 0$.

$$2(0) + z = -6$$

$$z = -6$$

The y -intercept occurs at the point $(0, 0, -6)$.

These two points show that the yz -plane is intersected in R^3 along the line $2y + z = -6$.

Pulling together all of this information we can see that the surface in R^3 of $2y + z = -6$ is a plane that's parallel to the x -axis and intersects the yz -plane in the line $2y + z = -6$.

