Topic: Distance between points in three dimensions

Question: Find the distance between the points.

$(4, -1, 2)$

$(3, 2, -1)$

Answer choices:

A $\sqrt{19}$

B 7

C $\sqrt{7}$

D 19

Solution: A

To find the distance between two points in three dimensions, we'll use

$$D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}$$

where (x_1, y_1, z_1) is one point and (x_2, y_2, z_2) is the other point.

$$D = \sqrt{(3 - 4)^2 + \big[2 - (-1)\big]^2 + (-1 - 2)^2}$$

$$D = \sqrt{1 + 9 + 9}$$

$$D = \sqrt{19}$$

The distance between the points is $\sqrt{19}$.

Topic: Distance between points in three dimensions

Question: In which plane does the point lie?

$$(6,0,-1)$$

Answer choices:

A yz-plane

B $r\theta$-plane

C xy-plane

D xz-plane

Solution: D

We know that

- a point with a zero x-value lies in the yz-plane.
- a point with a zero y-value lies in the xz-plane.
- a point with a zero z-value lies in the xy-plane.

Since $(6,0,-1)$ has a zero y-value, it lies in the xz-plane.

Topic: Distance between points in three dimensions

Question: Which point is closest to the plane?

The xy-plane

Answer choices:

A $(-4,0,9)$

B $(-2,-1,-3)$

C $(0,3,4)$

D $(2,4,-8)$

Solution: B

To find the point that is closest to the xy-plane, we can take the absolute value of the z-coordinate for each of the answer choices. The value closest to 0, or 0 itself, is the point that's closest to the plane.

If we wanted to find the point closest to the yz-plane, we'd examine the x-coordinate in the same way. If we wanted to find the point closest to the xz-plane, we'd examine the y-coordinate in the same way.

For $(2,4,-8)$, $|z| = |-8| = 8$

For $(0,3,4)$, $|z| = |4| = 4$

For $(-2,-1,-3)$, $|z| = |-3| = 3$

For $(-4,0,9)$, $|z| = |9| = 9$

Since 3 is the value closest to 0, $(-2,-1,-3)$ is the closest point to the xy-plane.