

INTERSECTION OF LINES

Intersection of Lines in 2-Space

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In 2-space, two lines may

- 1) _____
- 2) _____
- 3) _____



Important Points to Remember

- When investigating the intersection of two lines, it is often most useful to work with their equations in **parametric form**.
- You must choose a **different parameter for each line**.
- If two lines are parallel, their direction vectors are scalar multiples of each other.

Example

Investigate the intersection of the following two lines.

$$L_1: (x, y) = (4, 2) + m(-1, 3)$$

$$L_2: (x, y) = (5, -1) + n(2, -6)$$

Example

Determine if and how the following pair of lines intersect.

$$L_1: (x, y) = (4, 9) + q(3, 4)$$

$$L_2: (x, y) = (-4, -9) + r(5, 6)$$

Intersection of Lines in 3-Space**Intersection of Lines in 3-Space**

In 3-space, two lines may

- 1) _____
- 2) _____
- 3) _____
- 4) _____

Example

Investigate the intersection of the following lines.

$$L_1: (x, y, z) = (1, 2, 3) + p(1, 0, -2)$$

$$L_2: (x, y, z) = (3, 4, 5) + q(2, 0, -4)$$

Example

Determine if and how the following lines intersect.

$$L_1: (x, y, z) = (1, 2, 3) + m(2, 3, 4)$$

$$L_2: (x, y, z) = (2, 3, 4) + n(1, 2, 3)$$

Example

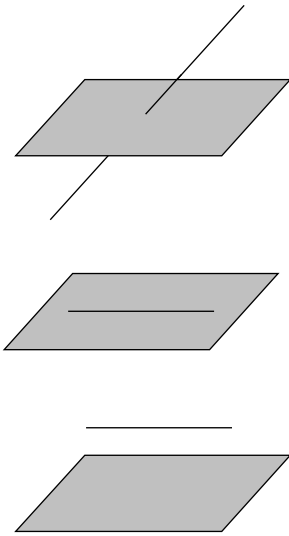
Determine if and how the following lines intersect.

$$L_1: (x, y, z) = (1, 2, 3) + g(1, -1, 5)$$

$$L_2: (x, y, z) = (3, 4, 5) + h(-1, 2, -2)$$

INTERSECTION OF A LINE AND A PLANE

Intersection of a Line and a Plane



Intersection of a Line and a Plane

In 3-space, a line and a plane may

- 1) _____
- 2) _____
- 3) _____



When solving problems involving the intersection of lines with planes, it is most convenient to work with _____ equations of lines and _____ equations of planes.

Example

Determine if and how the following line and plane intersect.

Line: $x = 4 - t$
 $y = 5 - t$
 $z = 3 + 2t$

Plane: $3x - y + 2z + 3 = 0$

Each point on the line can be written in the form of the parametric equations. To find where the line and plane intersect, we need to find the values of t that “fit” the plane.

Example

Determine if and how the line $(x, y, z) = (4, 3, -1) + t(0, 2, 1)$ and the plane $3x - y + 2z + 3 = 0$ intersect.

Example

Determine if and how the line $(x, y, z) = (1, 8, 1) + t(0, 2, 1)$ and the plane $3x - y + 2z + 3 = 0$ intersect.

Example

Find the point at which the normal to the plane $4x - 2y + 5z + 18 = 0$ through the point $(6, -2, -2)$ intersects the plane.