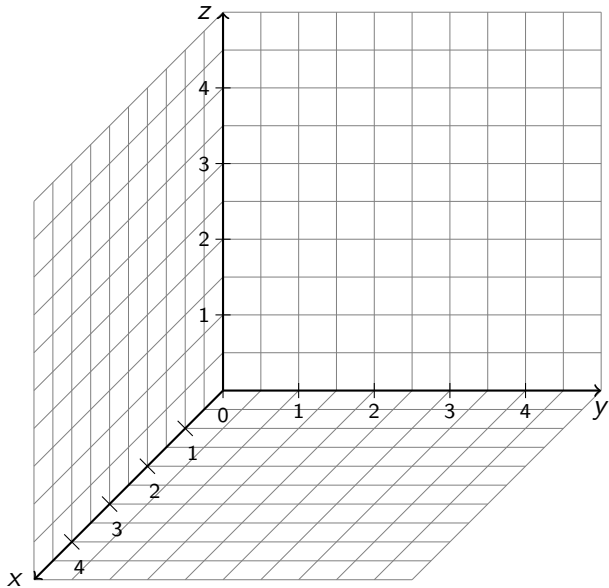


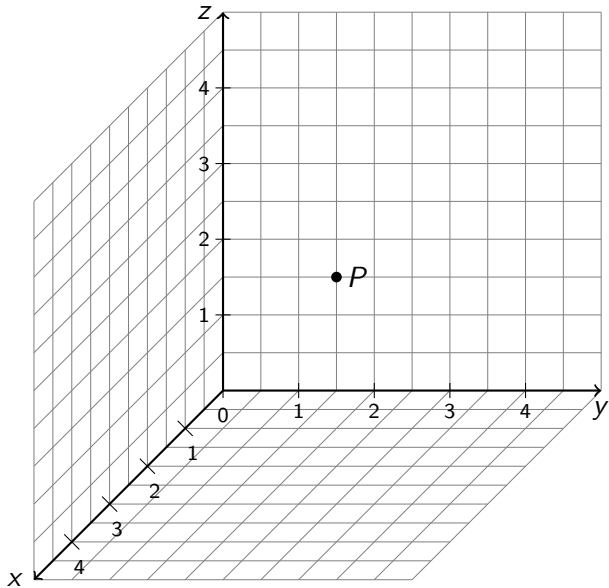
# Mathe Nachhilfe

## Analytische Geometrie

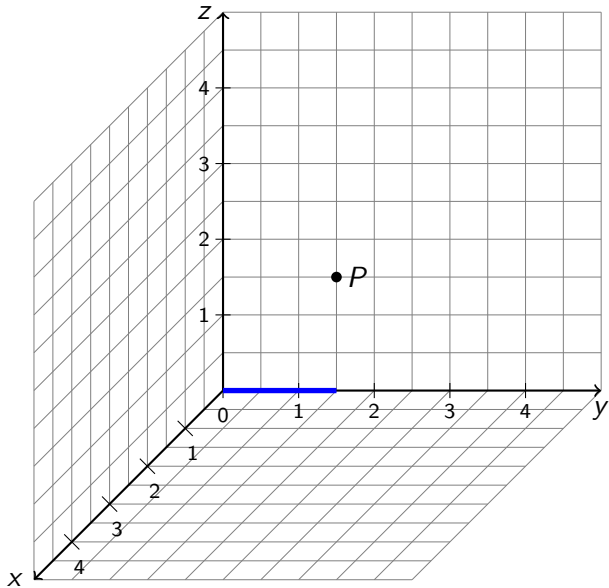
## 3D Koordinatensystem - Punkte ablesen



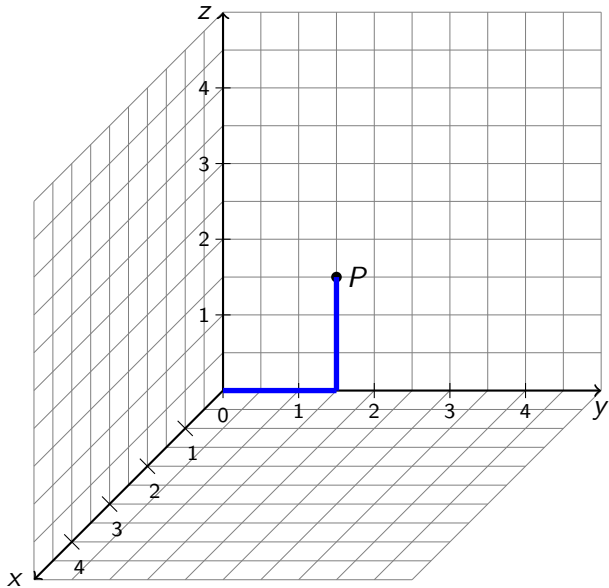
## 3D Koordinatensystem - Punkte ablesen



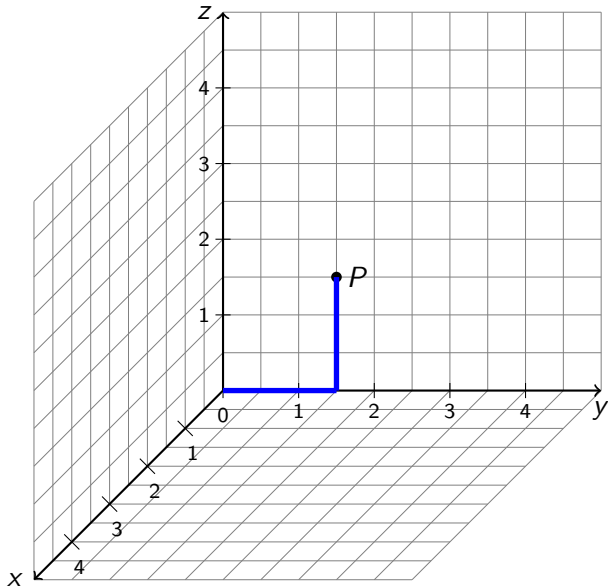
## 3D Koordinatensystem - Punkte ablesen



## 3D Koordinatensystem - Punkte ablesen

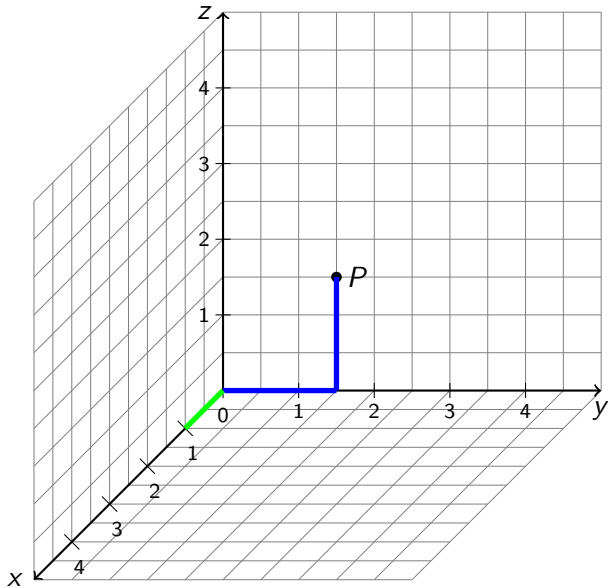


## 3D Koordinatensystem - Punkte ablesen



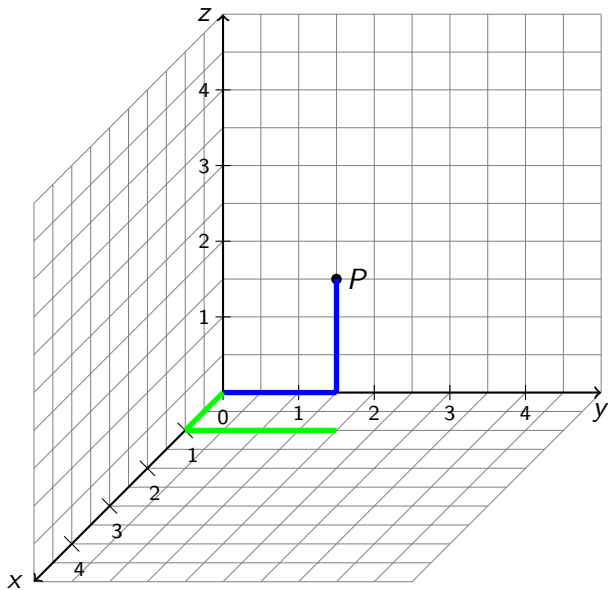
$$P(0, 1.5, 1.5)$$

## 3D Koordinatensystem - Punkte ablesen



$$P(0, 1.5, 1.5)$$

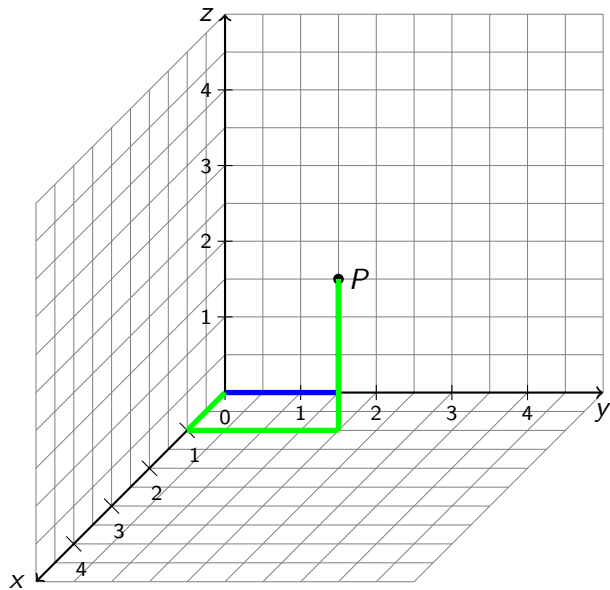
## 3D Koordinatensystem - Punkte ablesen



$$P(0, 1.5, 1.5)$$

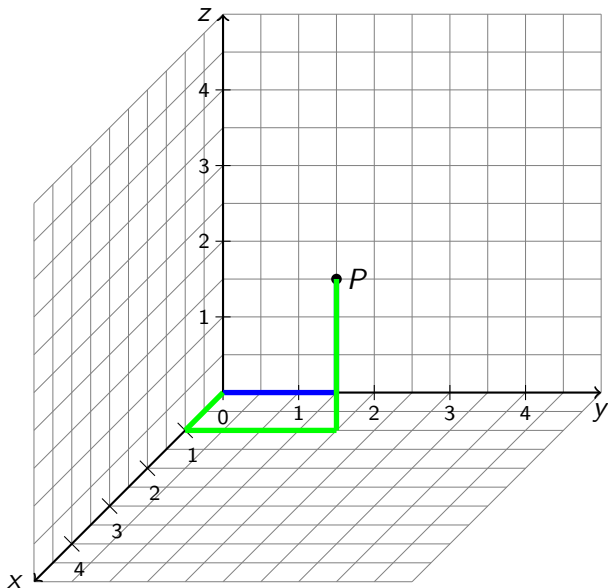


## 3D Koordinatensystem - Punkte ablesen

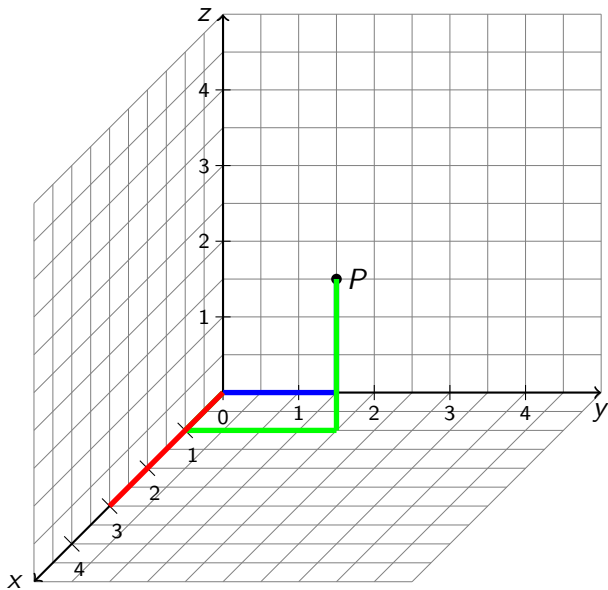


$$P(0, 1.5, 1.5)$$

## 3D Koordinatensystem - Punkte ablesen


$$P(0, 1.5, 1.5)$$
$$P(1, 2, 2)$$

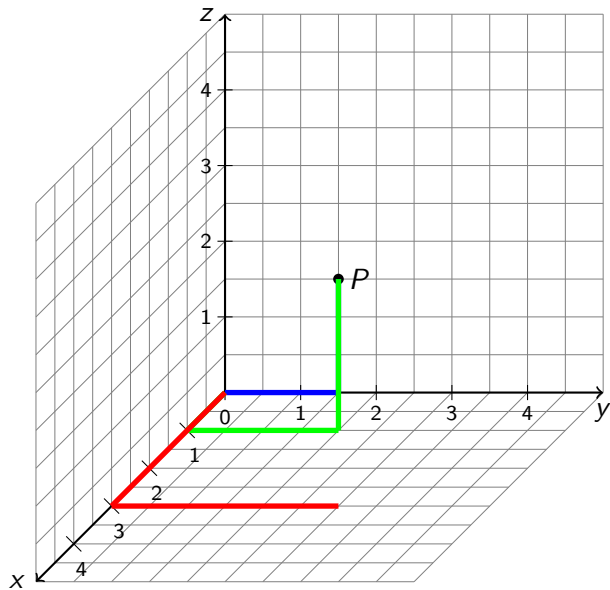
## 3D Koordinatensystem - Punkte ablesen



$$P(0, 1.5, 1.5)$$

$$P(1, 2, 2)$$

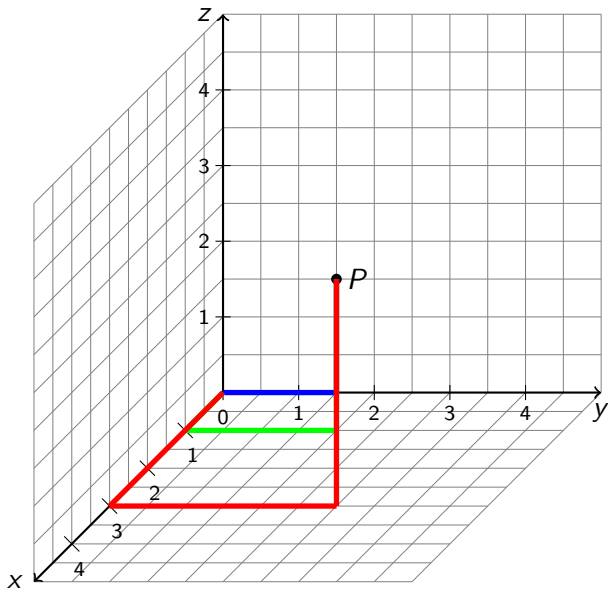
## 3D Koordinatensystem - Punkte ablesen



$$P(0, 1.5, 1.5)$$

$$P(1, 2, 2)$$

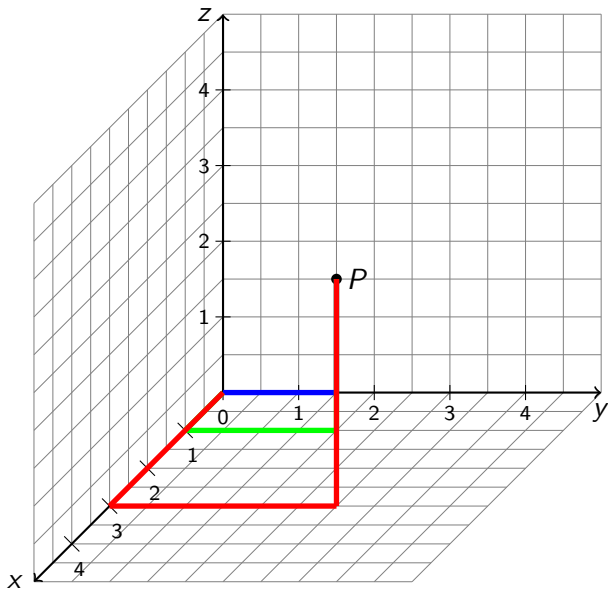
## 3D Koordinatensystem - Punkte ablesen



$$P(0, 1.5, 1.5)$$

$$P(1, 2, 2)$$

## 3D Koordinatensystem - Punkte ablesen

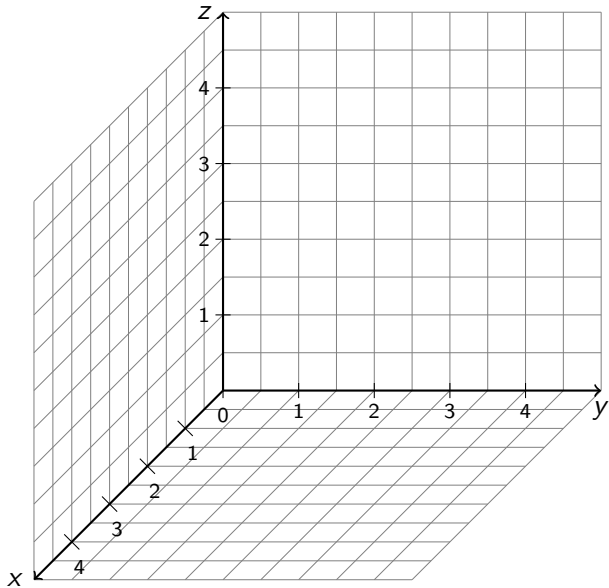


$$P(0, 1.5, 1.5)$$

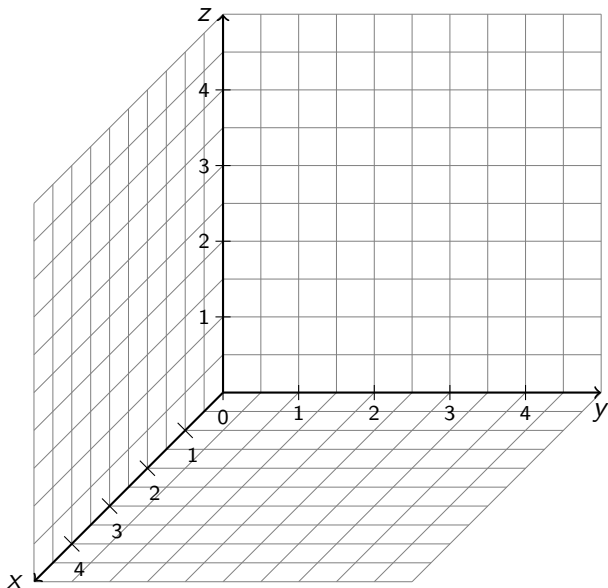
$$P(1, 2, 2)$$

$$P(3, 3, 3)$$

## 3D Koordinatensystem - Punkte eintragen



## 3D Koordinatensystem - Punkte eintragen



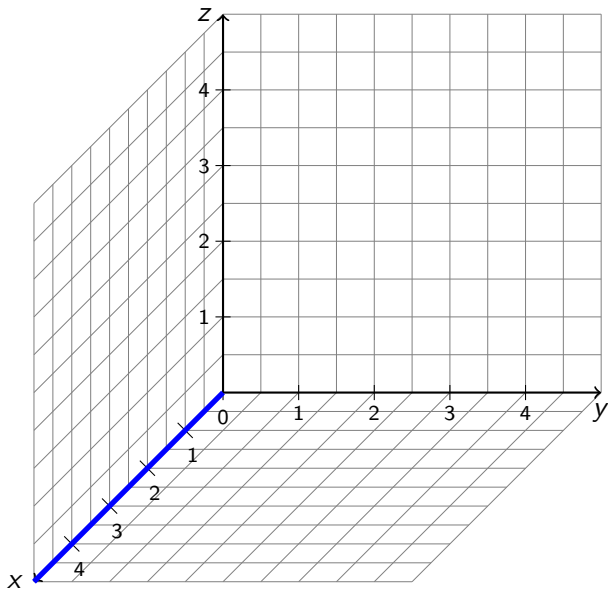
$P(5, 3, 6)$

$Q(4, 2, 1)$

$R(3, 5, 1)$



## 3D Koordinatensystem - Punkte eintragen

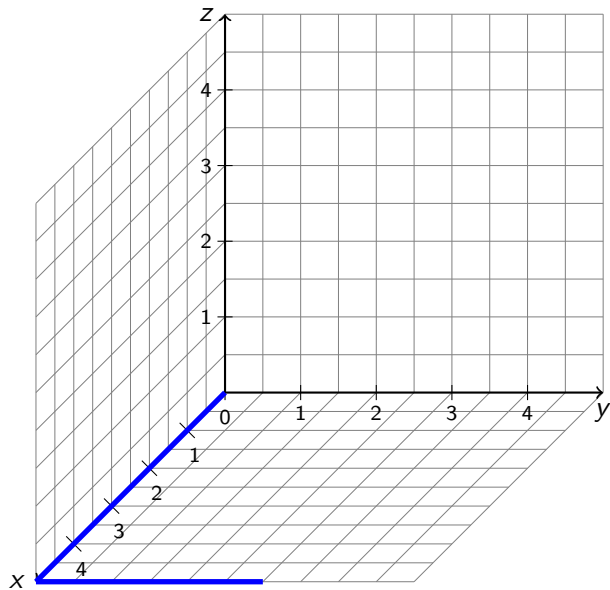


$P(5, 3, 6)$

$Q(4, 2, 1)$

$R(3, 5, 1)$

## 3D Koordinatensystem - Punkte eintragen

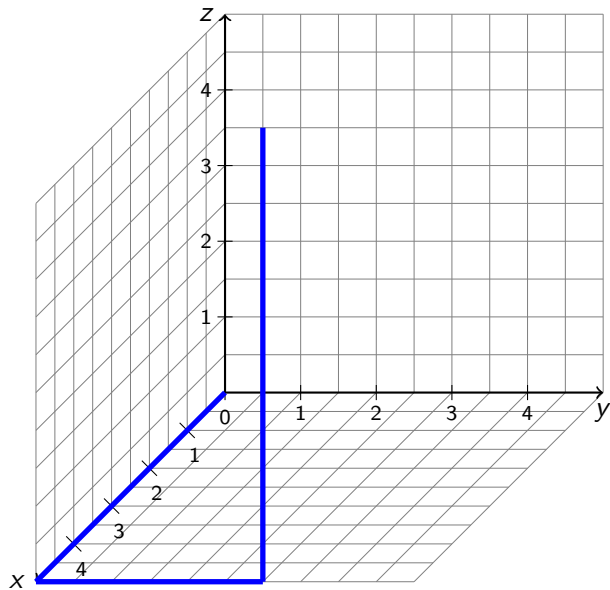


$P(5, 3, 6)$

$Q(4, 2, 1)$

$R(3, 5, 1)$

## 3D Koordinatensystem - Punkte eintragen

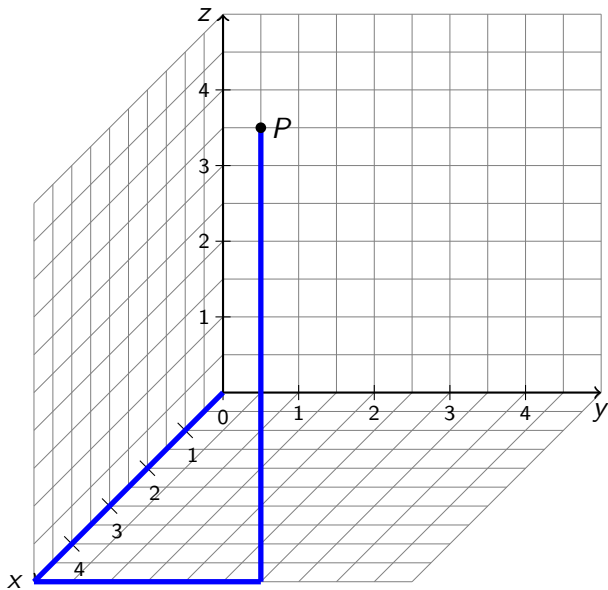


$P(5, 3, 6)$

$Q(4, 2, 1)$

$R(3, 5, 1)$

## 3D Koordinatensystem - Punkte eintragen

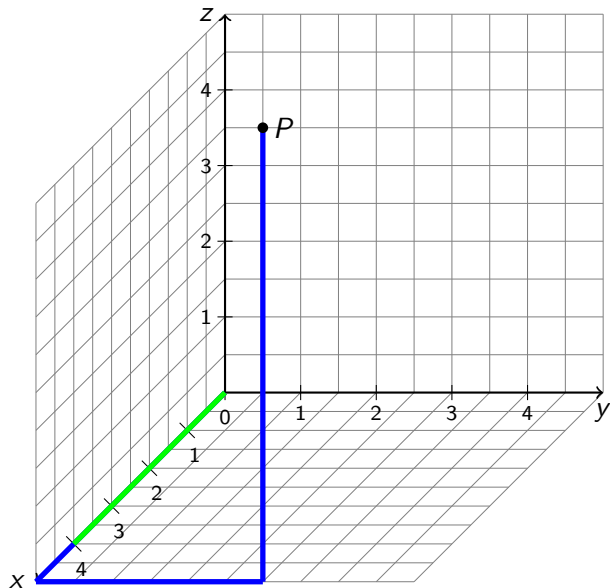


$P(5, 3, 6)$

$Q(4, 2, 1)$

$R(3, 5, 1)$

## 3D Koordinatensystem - Punkte eintragen

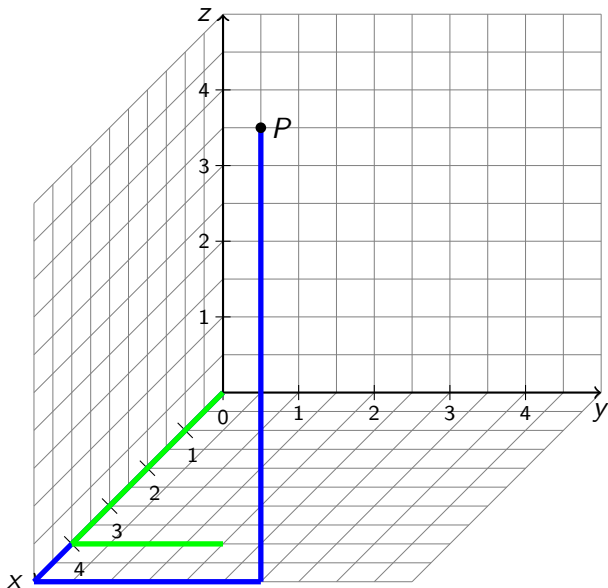


$P(5, 3, 6)$

$Q(4, 2, 1)$

$R(3, 5, 1)$

## 3D Koordinatensystem - Punkte eintragen

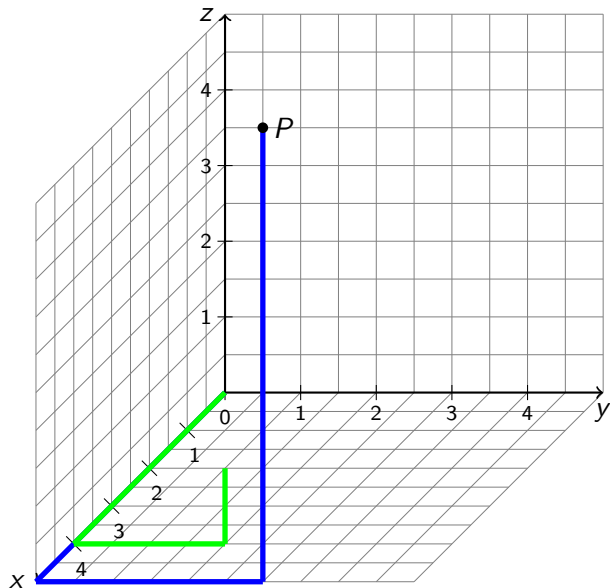


$$P(5, 3, 6)$$

$$Q(4, 2, 1)$$

$$R(3, 5, 1)$$

## 3D Koordinatensystem - Punkte eintragen

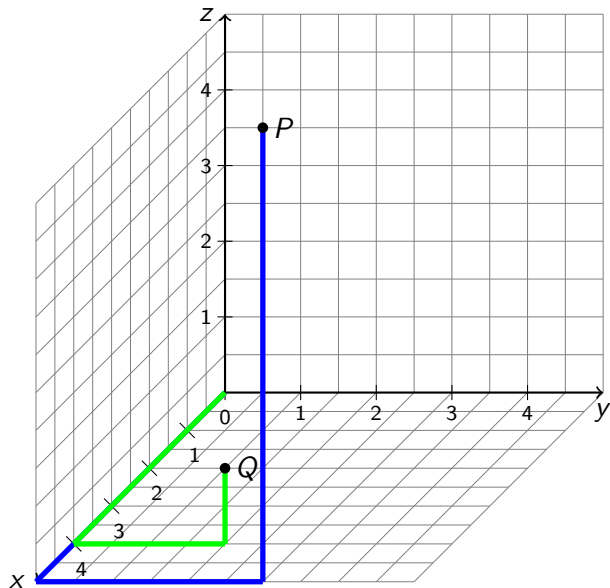


$$P(5, 3, 6)$$

$$Q(4, 2, 1)$$

$$R(3, 5, 1)$$

## 3D Koordinatensystem - Punkte eintragen



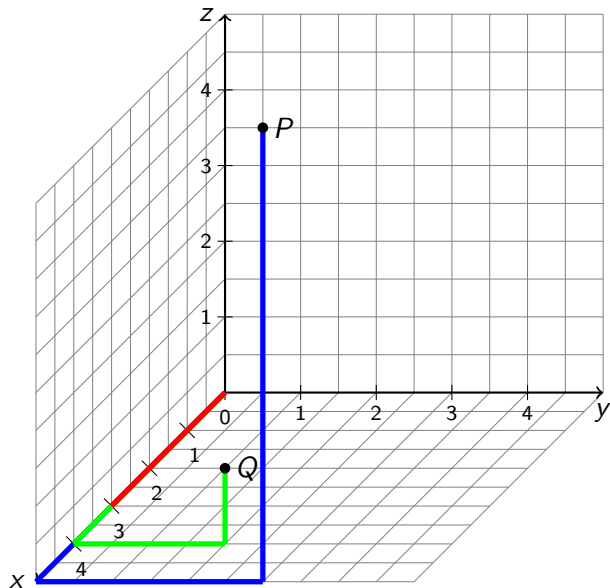
$$P(5, 3, 6)$$

$$Q(4, 2, 1)$$

$$R(3, 5, 1)$$



## 3D Koordinatensystem - Punkte eintragen

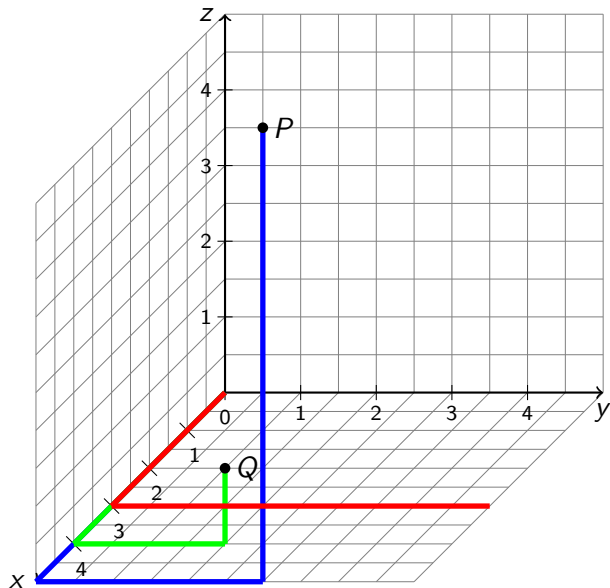


$P(5, 3, 6)$

$Q(4, 2, 1)$

$R(3, 5, 1)$

## 3D Koordinatensystem - Punkte eintragen

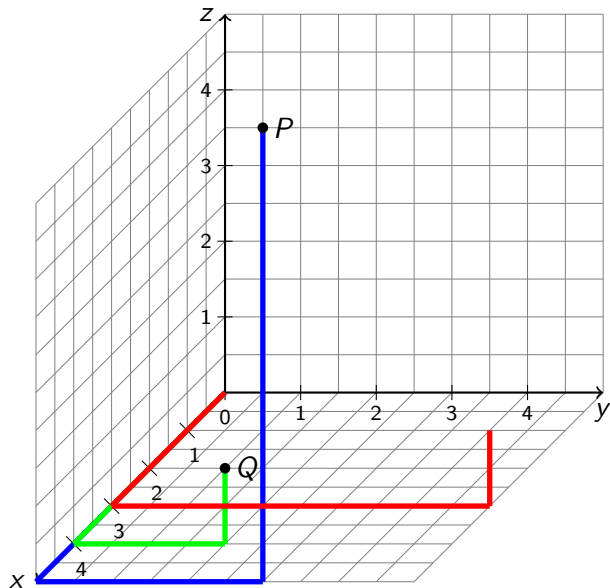


$$P(5, 3, 6)$$

$$Q(4, 2, 1)$$

$$R(3, 5, 1)$$

## 3D Koordinatensystem - Punkte eintragen

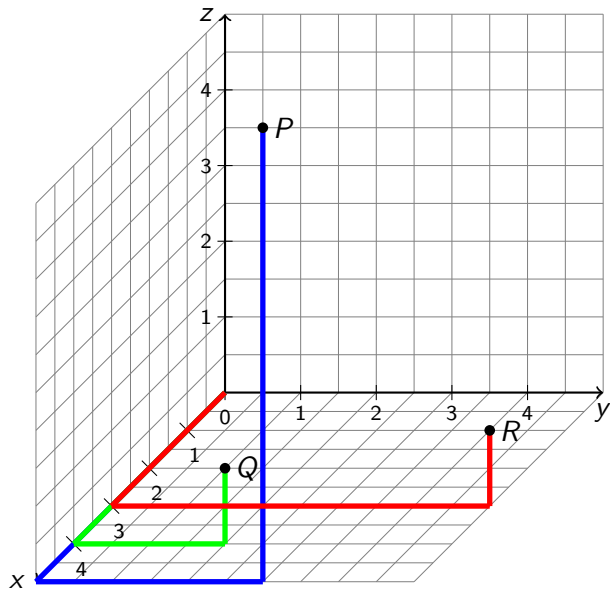


$$P(5, 3, 6)$$

$$Q(4, 2, 1)$$

$$R(3, 5, 1)$$

## 3D Koordinatensystem - Punkte eintragen

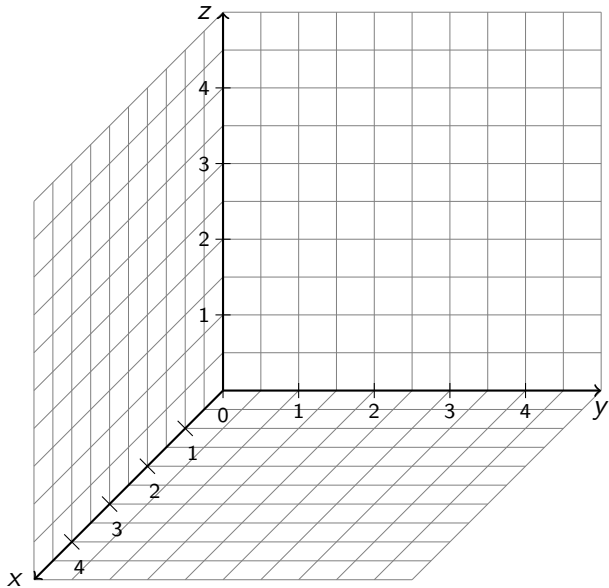


$P(5, 3, 6)$

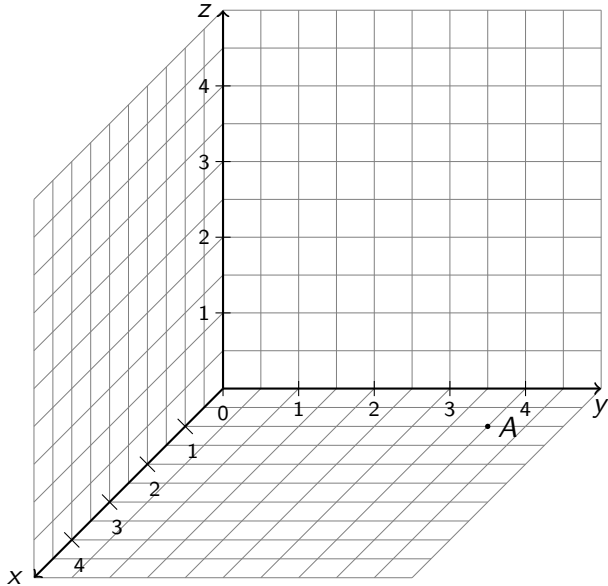
$Q(4, 2, 1)$

$R(3, 5, 1)$

# Vektoren - Ortsvektoren

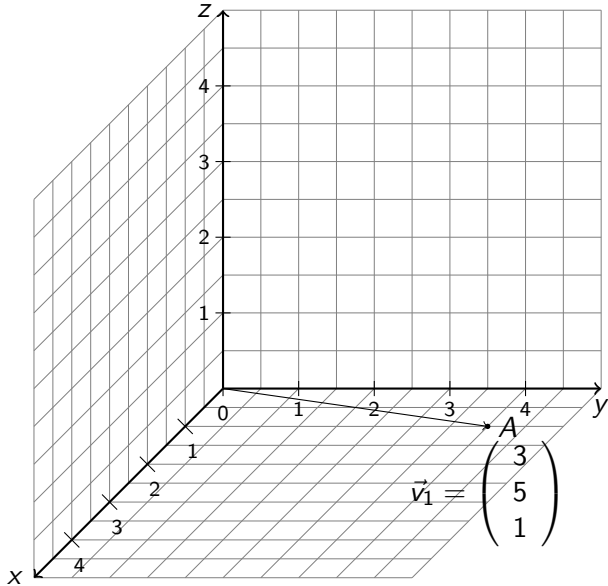


## Vektoren - Ortsvektoren



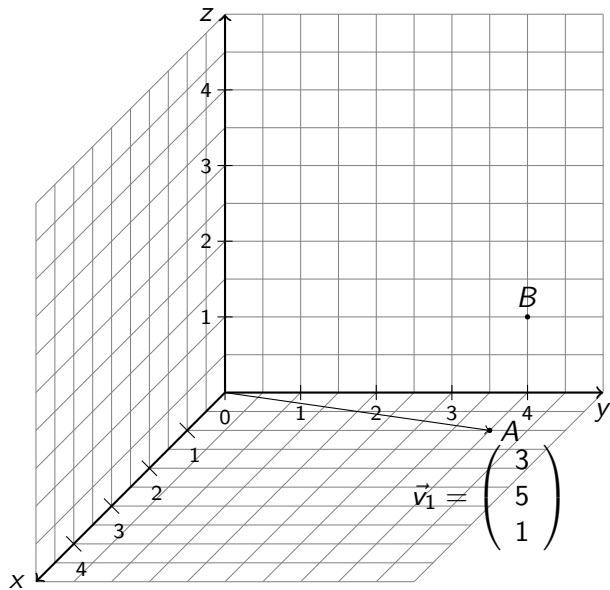
$$A = (3, 5, 1)$$

## Vektoren - Ortsvektoren



$$A = (3, 5, 1)$$

## Vektoren - Ortsvektoren

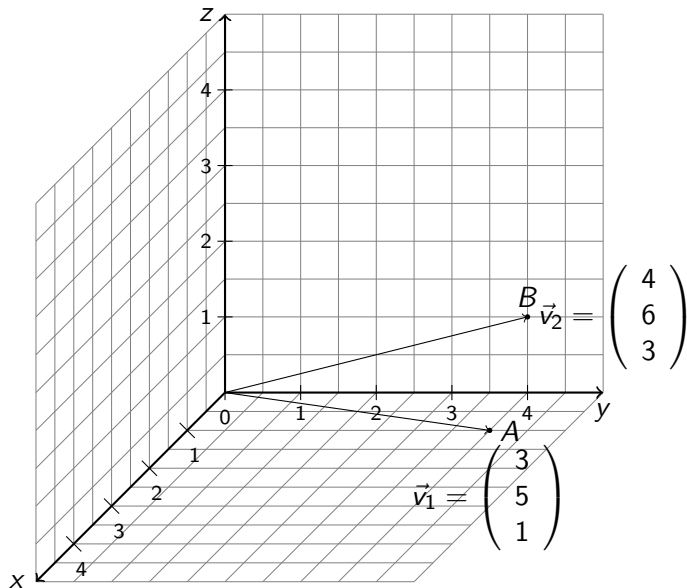


$$A = (3, 5, 1)$$

$$B = (4, 6, 3)$$



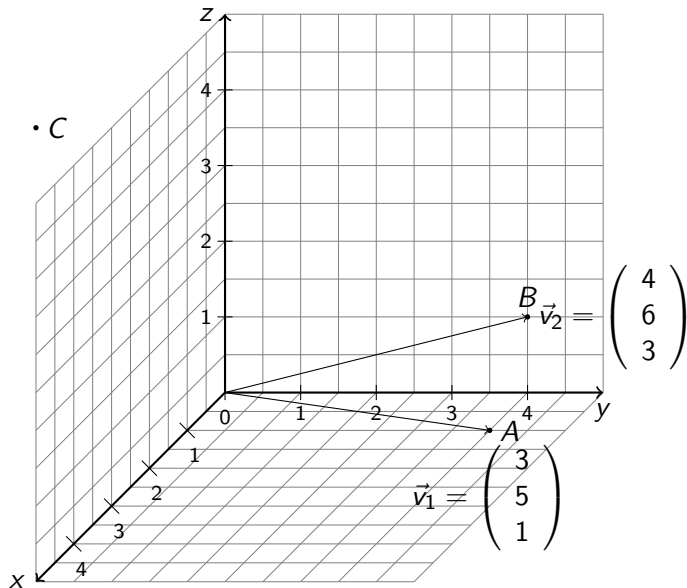
## Vektoren - Ortsvektoren



$$A = (3, 5, 1)$$

$$B = (4, 6, 3)$$

## Vektoren - Ortsvektoren

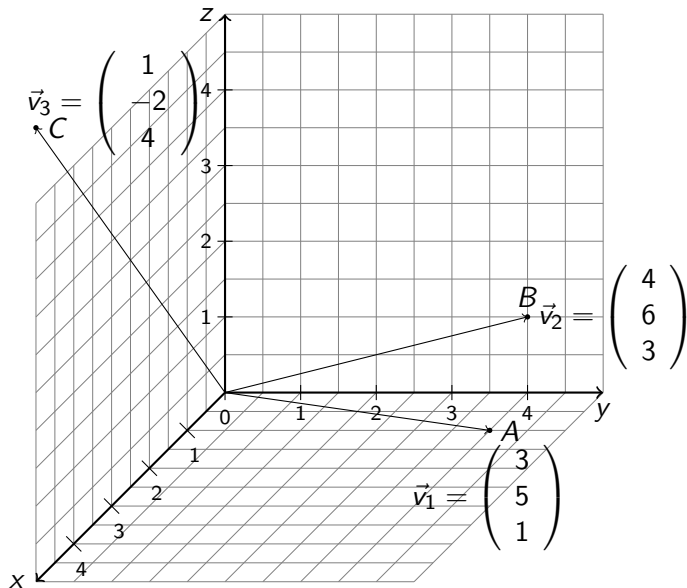


$$A = (3, 5, 1)$$

$$B = (4, 6, 3)$$

$$C = (1, -2, 4)$$

## Vektoren - Ortsvektoren

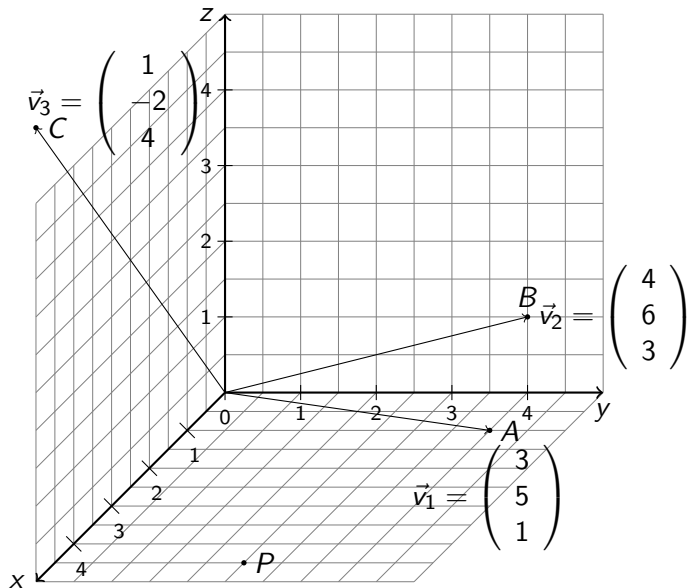


$$A = (3, 5, 1)$$

$$B = (4, 6, 3)$$

$$C = (1, -2, 4)$$

## Vektoren - Ortsvektoren



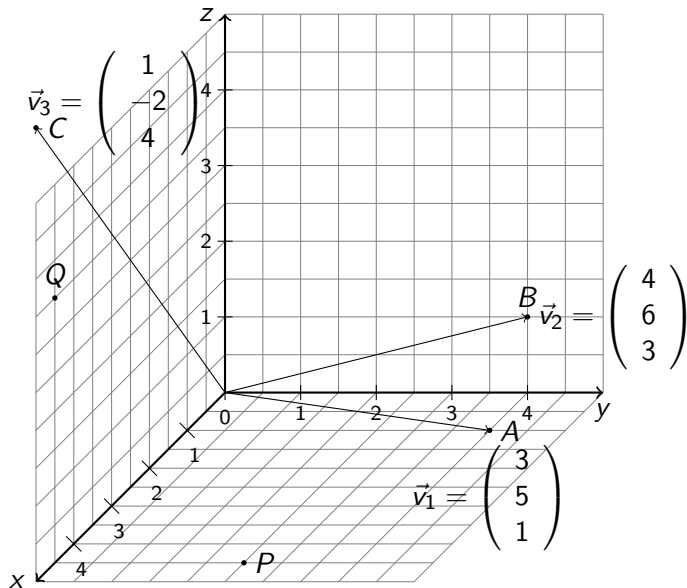
$$A = (3, 5, 1)$$

$$B = (4, 6, 3)$$

$$C = (1, -2, 4)$$

$$P = (3.5, 2, -0.5)$$

## Vektoren - Ortsvektoren



$$A = (3, 5, 1)$$

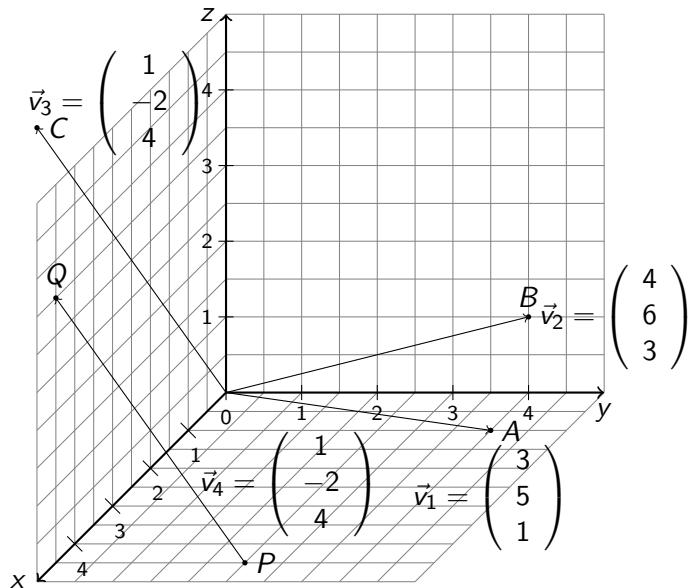
$$B = (4, 6, 3)$$

$$C = (1, -2, 4)$$

$$P = (3.5, 2, -0.5)$$

$$Q = (4.5, 0, 3.5)$$

## Vektoren - Ortsvektoren



$$A = (3, 5, 1)$$

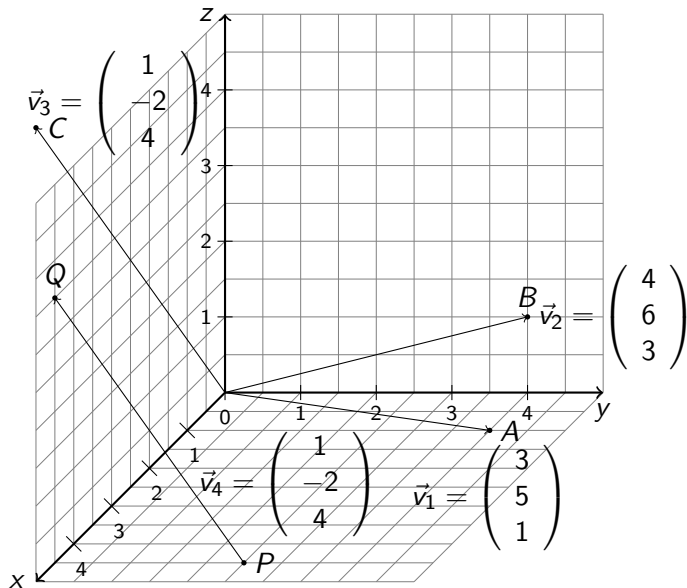
$$B = (4, 6, 3)$$

$$C = (1, -2, 4)$$

$$P = (3.5, 2, -0.5)$$

$$Q = (4.5, 0, 3.5)$$

## Vektoren - Ortsvektoren



$$A = (3, 5, 1)$$

$$B = (4, 6, 3)$$

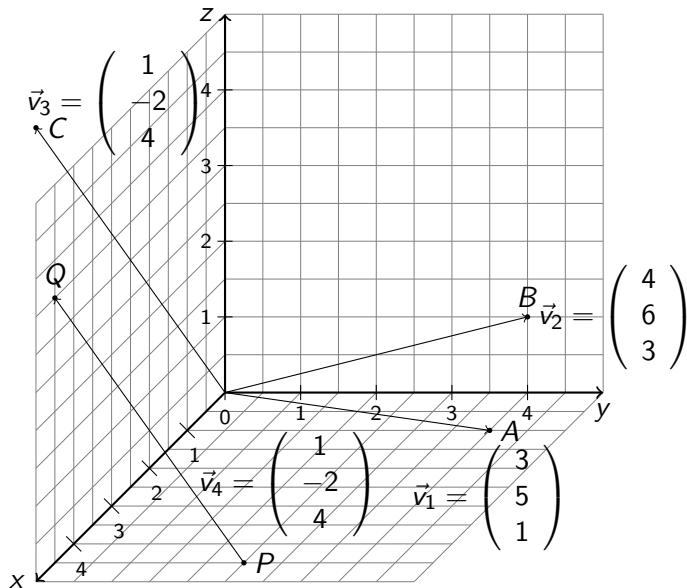
$$C = (1, -2, 4)$$

$$P = (3.5, 2, -0.5)$$

$$Q = (4.5, 0, 3.5)$$

$$\vec{v}_1 = \vec{OA}$$

## Vektoren - Ortsvektoren



$$A = (3, 5, 1)$$

$$B = (4, 6, 3)$$

$$C = (1, -2, 4)$$

$$P = (3.5, 2, -0.5)$$

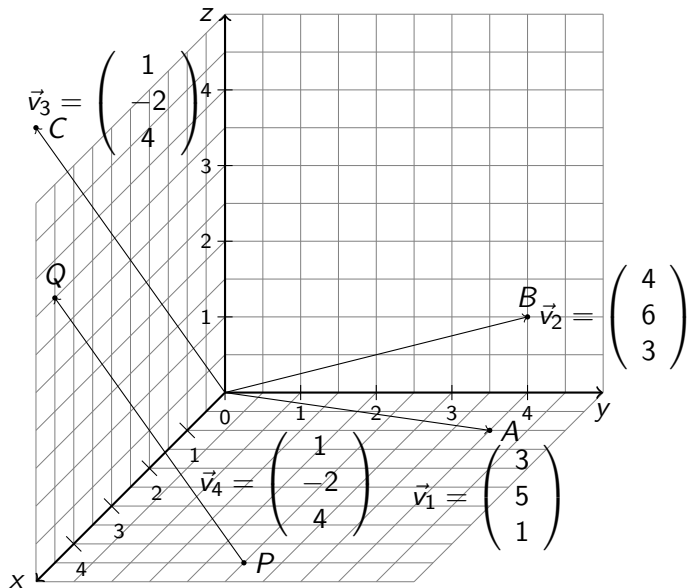
$$Q = (4.5, 0, 3.5)$$

$$\vec{v}_1 = \vec{OA}$$

$$\vec{v}_2 = \vec{OB}$$



## Vektoren - Ortsvektoren



$$A = (3, 5, 1)$$

$$B = (4, 6, 3)$$

$$C = (1, -2, 4)$$

$$P = (3.5, 2, -0.5)$$

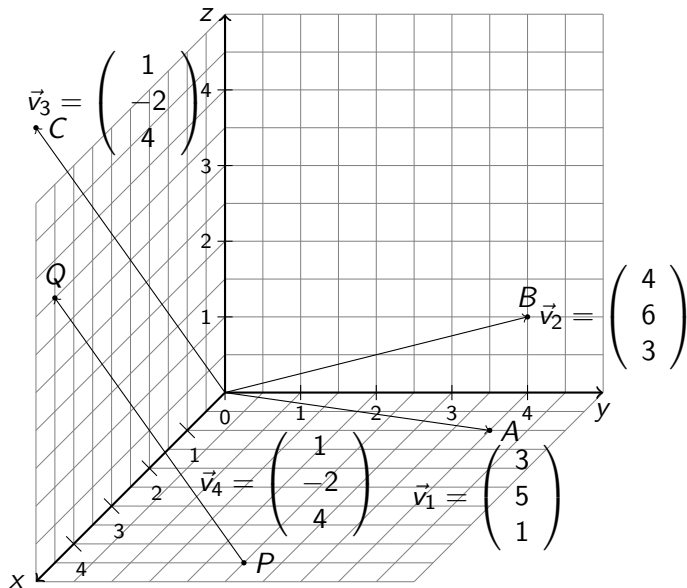
$$Q = (4.5, 0, 3.5)$$

$$\vec{v}_1 = \vec{OA}$$

$$\vec{v}_2 = \vec{OB}$$

$$\vec{v}_3 = \vec{OC}$$

## Vektoren - Ortsvektoren



$$A = (3, 5, 1)$$

$$B = (4, 6, 3)$$

$$C = (1, -2, 4)$$

$$P = (3.5, 2, -0.5)$$

$$Q = (4.5, 0, 3.5)$$

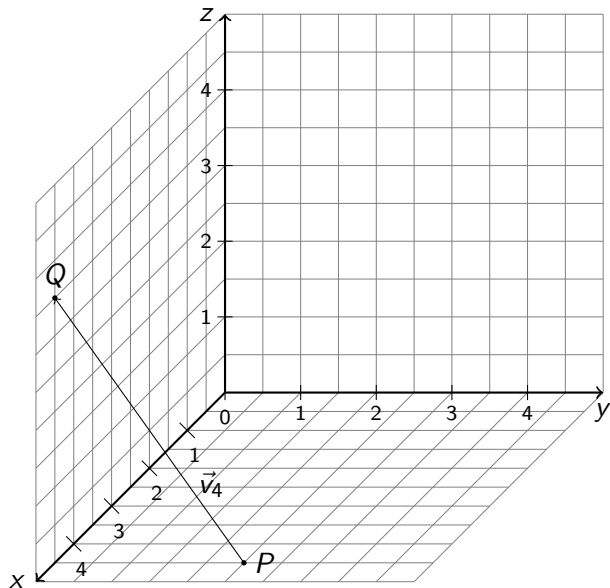
$$\vec{v}_1 = \vec{OA}$$

$$\vec{v}_2 = \vec{OB}$$

$$\vec{v}_3 = \vec{OC}$$

$$\vec{v}_4 = \vec{PQ} = \vec{v}_3$$

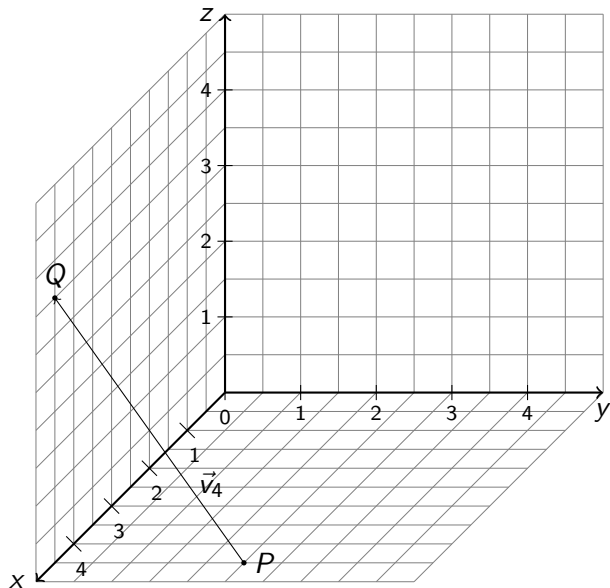
## Vektoren durch zwei Punkte



$$P = (3.5, 2, -0.5)$$

$$Q = (4.5, 0, 3.5)$$

## Vektoren durch zwei Punkte

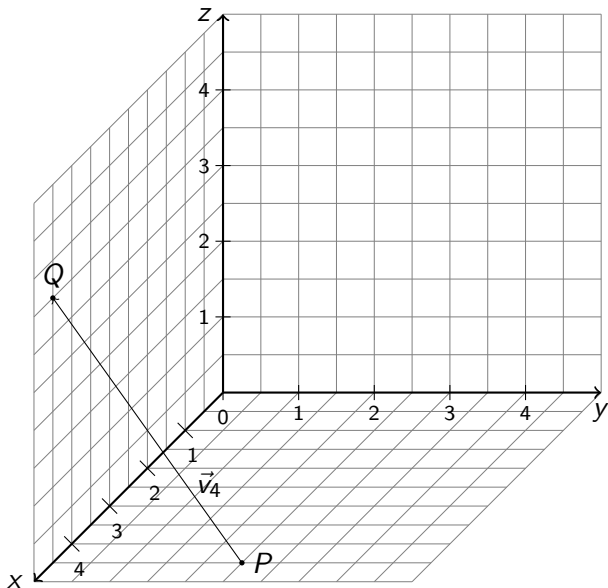


$$P = (3.5, 2, -0.5)$$

$$Q = (4.5, 0, 3.5)$$

$$\vec{v}_4 = \vec{PQ} = \vec{OQ} - \vec{OP}$$

## Vektoren durch zwei Punkte



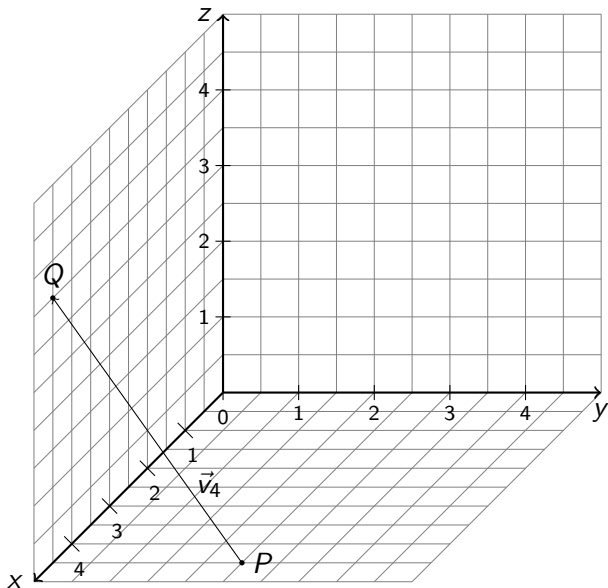
$$P = (3.5, 2, -0.5)$$

$$Q = (4.5, 0, 3.5)$$

$$\vec{v}_4 = \vec{PQ} = \vec{OQ} - \vec{OP}$$

$$\vec{v}_4 = \begin{pmatrix} x_q - x_p \\ y_q - y_p \\ z_q - z_p \end{pmatrix}$$

## Vektoren durch zwei Punkte



$$P = (3.5, 2, -0.5)$$

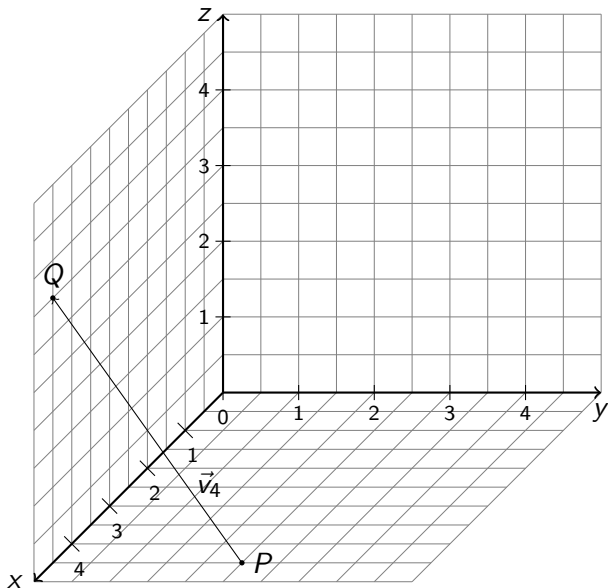
$$Q = (4.5, 0, 3.5)$$

$$\vec{v}_4 = \vec{PQ} = \vec{OQ} - \vec{OP}$$

$$\vec{v}_4 = \begin{pmatrix} x_q - x_p \\ y_q - y_p \\ z_q - z_p \end{pmatrix}$$

$$\vec{v}_4 = \begin{pmatrix} 4.5 - 3.5 \\ 0 - 2 \\ 3.5 - (-0.5) \end{pmatrix}$$

## Vektoren durch zwei Punkte



$$P = (3.5, 2, -0.5)$$

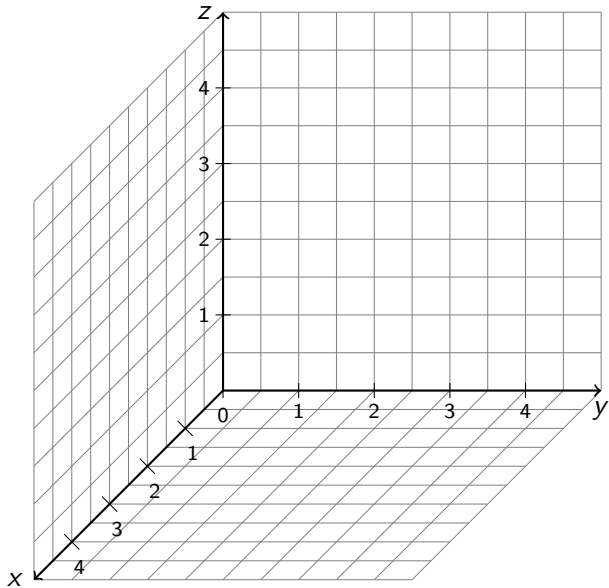
$$Q = (4.5, 0, 3.5)$$

$$\vec{v}_4 = \vec{PQ} = \vec{OQ} - \vec{OP}$$

$$\vec{v}_4 = \begin{pmatrix} x_q - x_p \\ y_q - y_p \\ z_q - z_p \end{pmatrix}$$

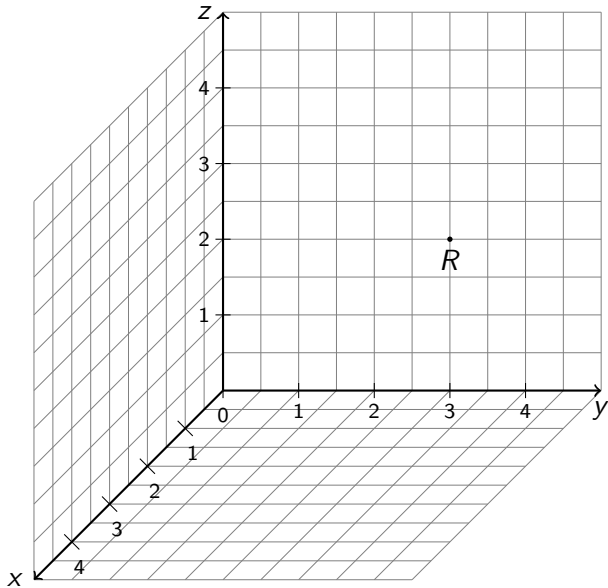
$$\vec{v}_4 = \begin{pmatrix} 4.5 - 3.5 \\ 0 - 2 \\ 3.5 - (-0.5) \end{pmatrix} = \begin{pmatrix} 1 \\ -2 \\ 4 \end{pmatrix}$$

## Länge eines Vektors - 2D



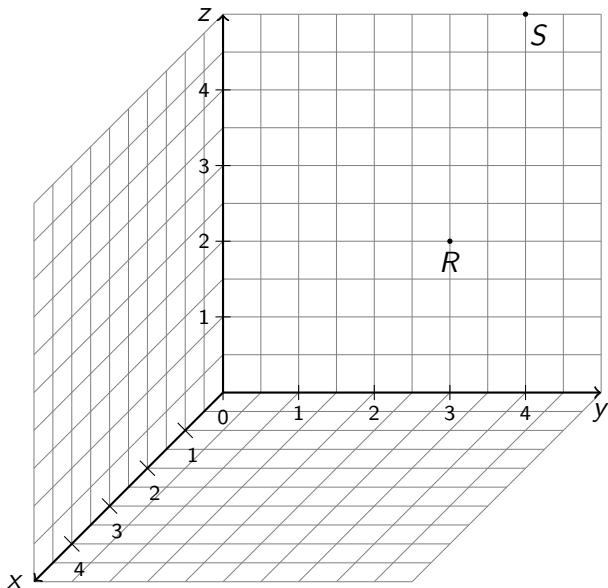


## Länge eines Vektors - 2D



$$R = (3, 2)$$

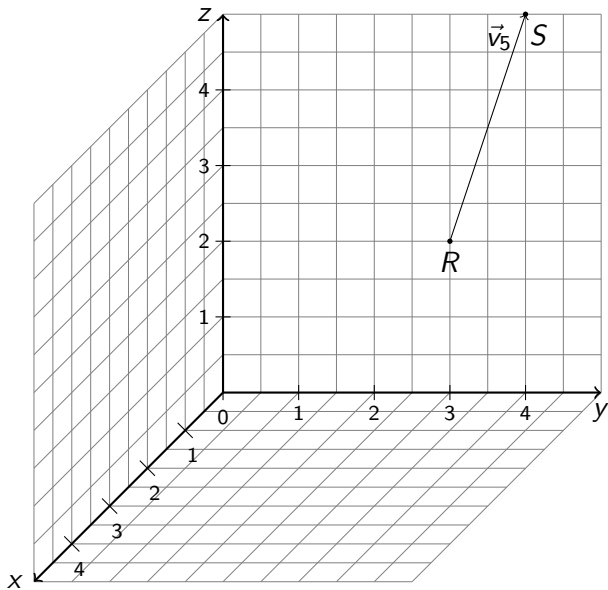
## Länge eines Vektors - 2D



$$R = (3, 2)$$

$$S = (4, 5)$$

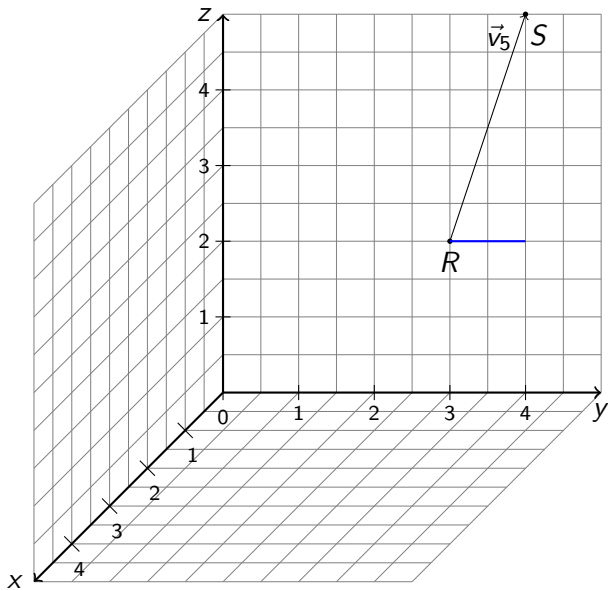
## Länge eines Vektors - 2D



$$R = (3, 2)$$

$$S = (4, 5)$$

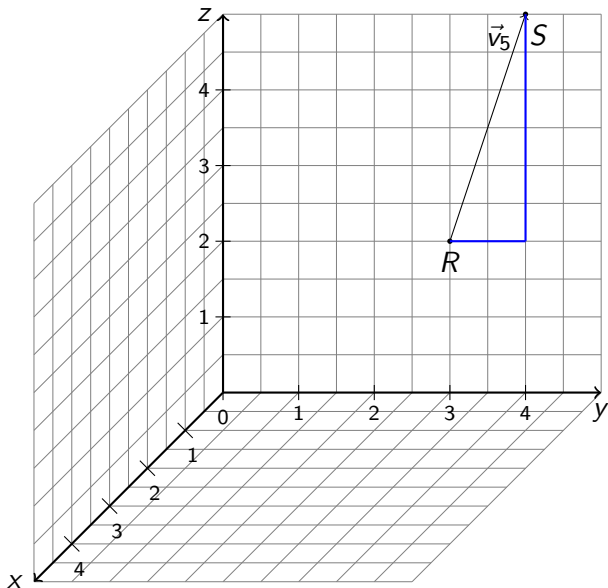
## Länge eines Vektors - 2D



$$R = (3, 2)$$

$$S = (4, 5)$$

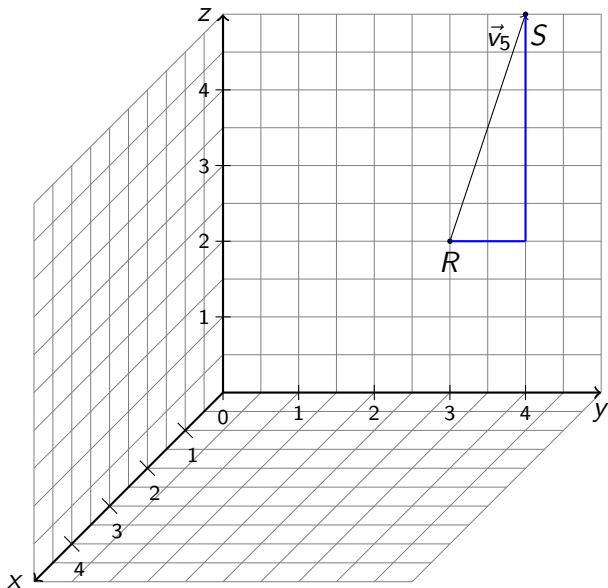
## Länge eines Vektors - 2D



$$R = (3, 2)$$

$$S = (4, 5)$$

## Länge eines Vektors - 2D

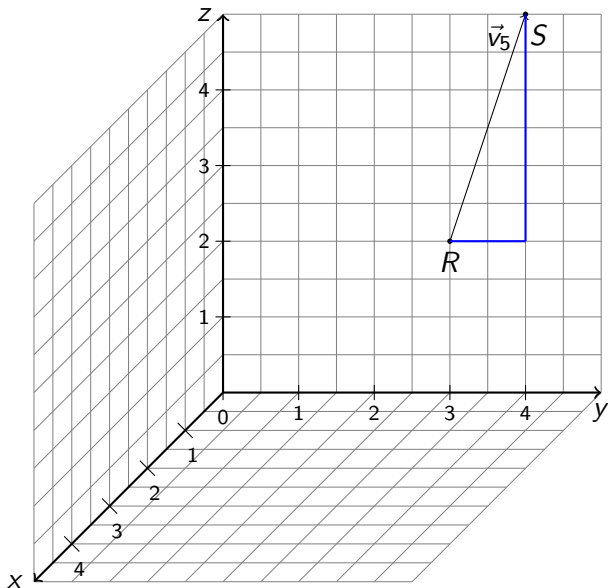


$$R = (3, 2)$$

$$S = (4, 5)$$

$$\vec{v}_5 = \begin{pmatrix} 4 - 3 \\ 5 - 2 \end{pmatrix}$$

## Länge eines Vektors - 2D

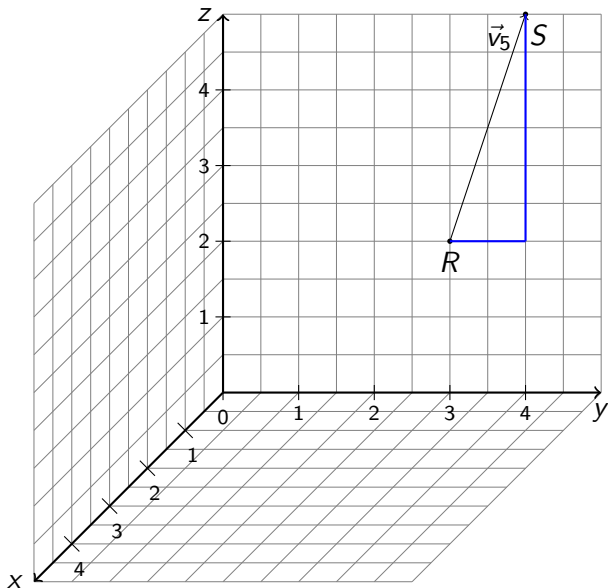


$$R = (3, 2)$$

$$S = (4, 5)$$

$$\vec{v}_5 = \begin{pmatrix} 4 - 3 \\ 5 - 2 \end{pmatrix} = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$$

## Länge eines Vektors - 2D



$$R = (3, 2)$$

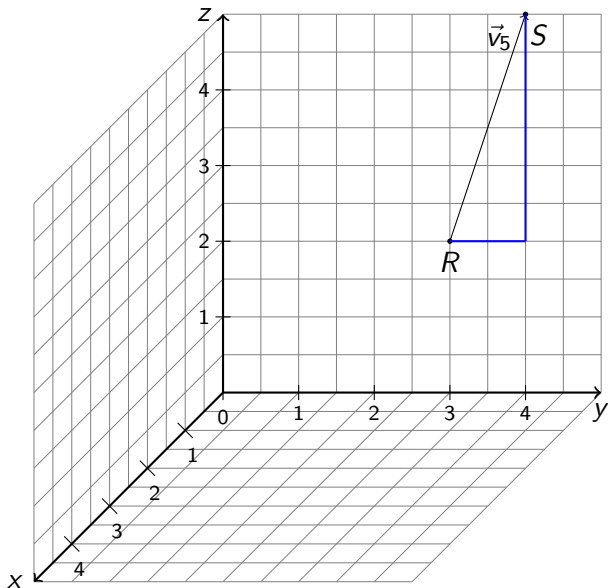
$$S = (4, 5)$$

$$\vec{v}_5 = \begin{pmatrix} 4 - 3 \\ 5 - 2 \end{pmatrix} = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$$

$$|\vec{v}_5| = \sqrt{x^2 + y^2}$$



## Länge eines Vektors - 2D



$$R = (3, 2)$$

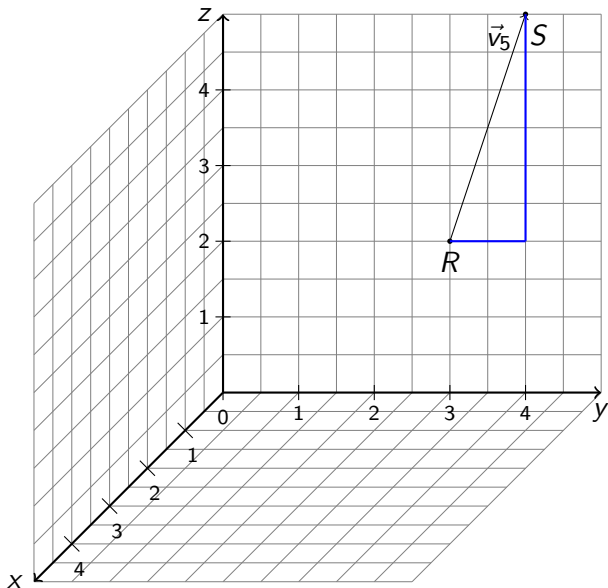
$$S = (4, 5)$$

$$\vec{v}_5 = \begin{pmatrix} 4 - 3 \\ 5 - 2 \end{pmatrix} = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$$

$$|\vec{v}_5| = \sqrt{x^2 + y^2}$$

$$|\vec{v}_5| = \sqrt{1^2 + 3^2}$$

## Länge eines Vektors - 2D



$$R = (3, 2)$$

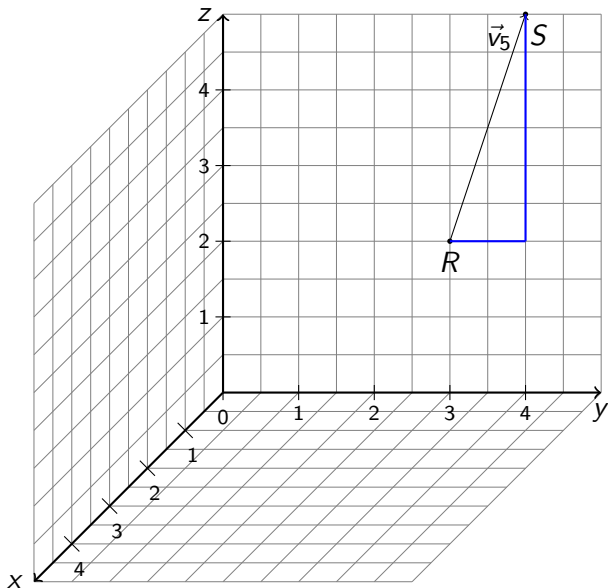
$$S = (4, 5)$$

$$\vec{v}_5 = \begin{pmatrix} 4 - 3 \\ 5 - 2 \end{pmatrix} = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$$

$$|\vec{v}_5| = \sqrt{x^2 + y^2}$$

$$|\vec{v}_5| = \sqrt{1^2 + 3^2} = \sqrt{7}$$

## Länge eines Vektors - 2D



$$R = (3, 2)$$

$$S = (4, 5)$$

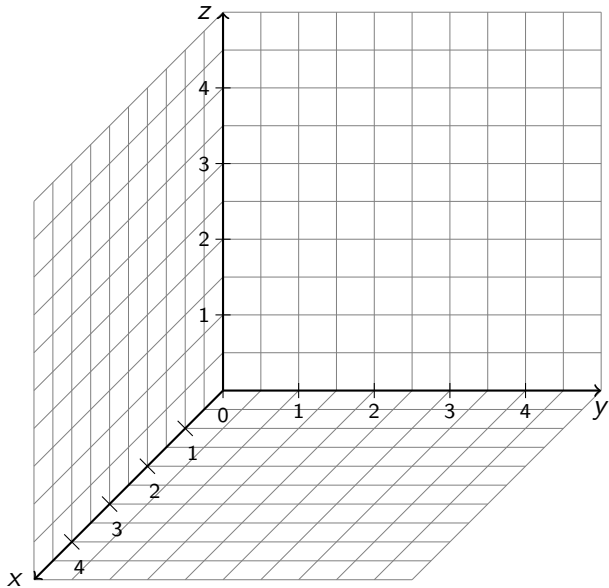
$$\vec{v}_5 = \begin{pmatrix} 4 - 3 \\ 5 - 2 \end{pmatrix} = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$$

$$|\vec{v}_5| = \sqrt{x^2 + y^2}$$

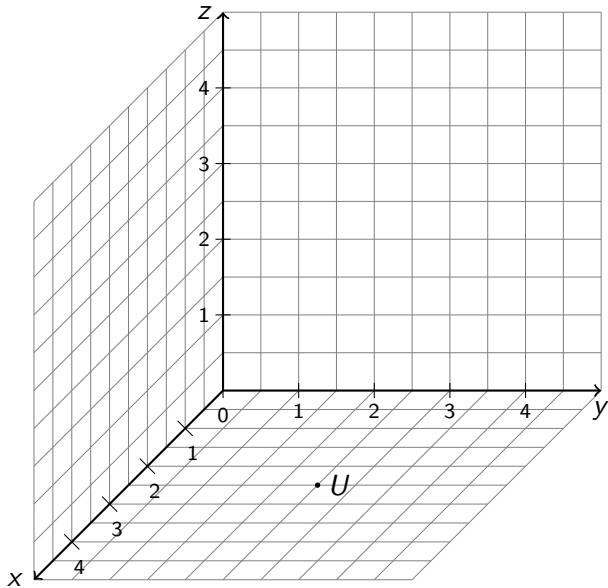
$$|\vec{v}_5| = \sqrt{1^2 + 3^2} = \sqrt{7}$$

$$|\vec{v}_5| \approx 2.6458$$

## Länge eines Vektors - 3D

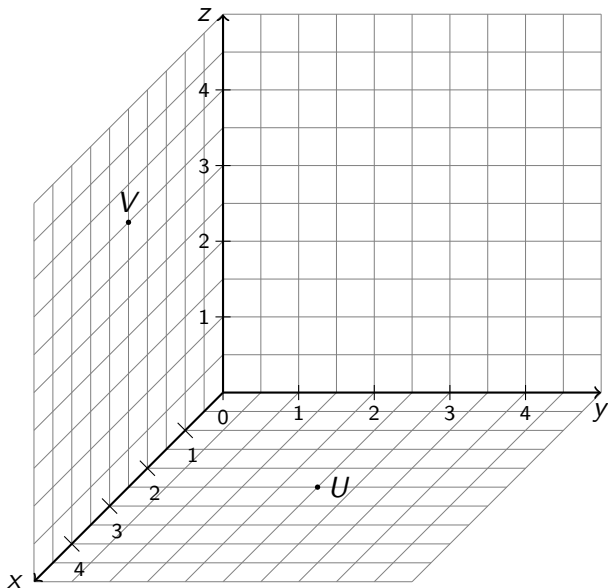


## Länge eines Vektors - 3D



$$U = (1.5, 2, -0.5)$$

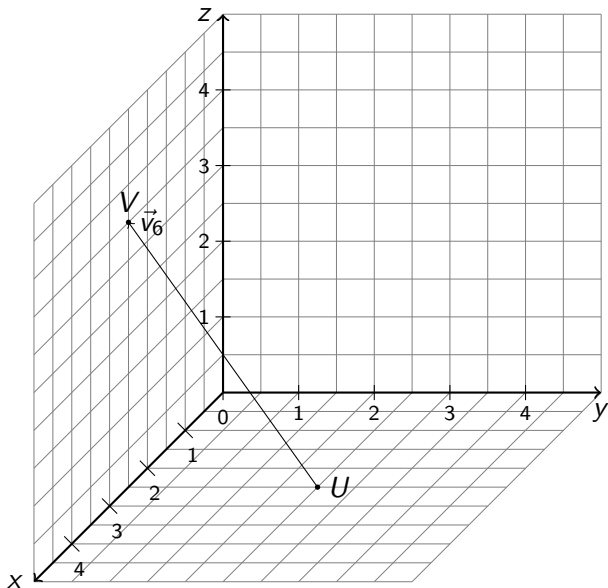
## Länge eines Vektors - 3D



$$U = (1.5, 2, -0.5)$$

$$V = (2.5, 0, 3.5)$$

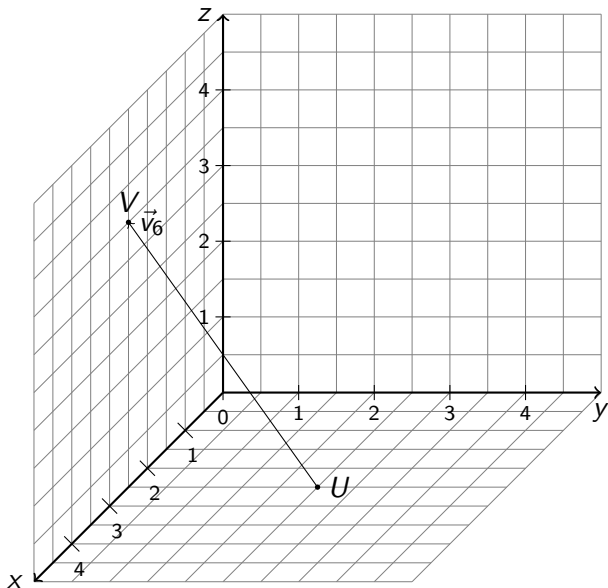
## Länge eines Vektors - 3D



$$U = (1.5, 2, -0.5)$$

$$V = (2.5, 0, 3.5)$$

## Länge eines Vektors - 3D



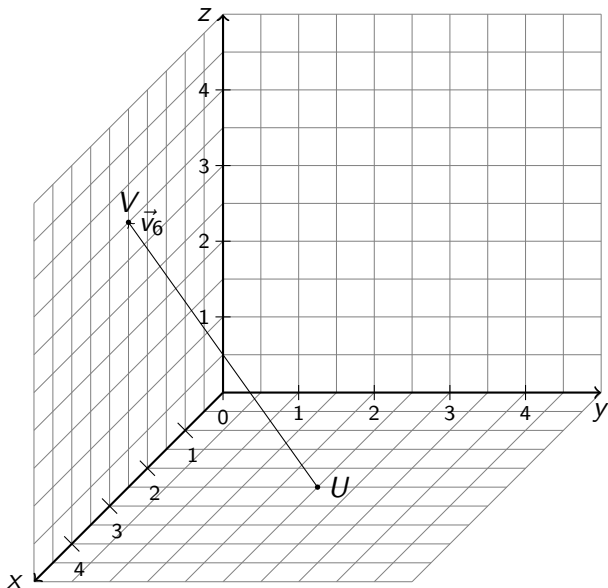
$$U = (1.5, 2, -0.5)$$

$$V = (2.5, 0, 3.5)$$

$$\vec{v}_6 = \begin{pmatrix} 2.5 - 1.5 \\ 0 - 2 \\ 3.5 - (-0.5) \end{pmatrix}$$



## Länge eines Vektors - 3D

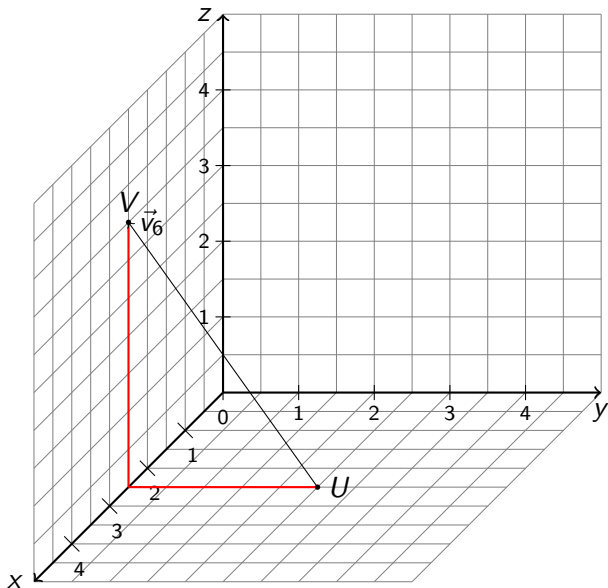


$$U = (1.5, 2, -0.5)$$

$$V = (2.5, 0, 3.5)$$

$$\vec{v}_6 = \begin{pmatrix} 2.5 - 1.5 \\ 0 - 2 \\ 3.5 - (-0.5) \end{pmatrix} = \begin{pmatrix} 1 \\ -2 \\ 4 \end{pmatrix}$$

## Länge eines Vektors - 3D

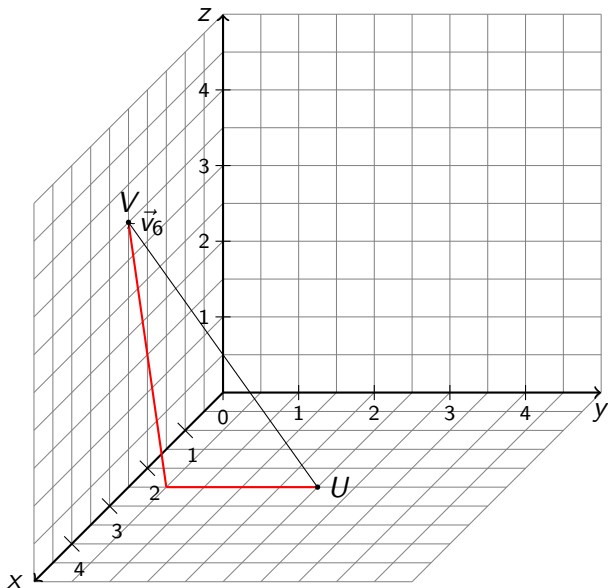


$$U = (1.5, 2, -0.5)$$

$$V = (2.5, 0, 3.5)$$

$$\vec{v}_6 = \begin{pmatrix} 2.5 - 1.5 \\ 0 - 2 \\ 3.5 - (-0.5) \end{pmatrix} = \begin{pmatrix} 1 \\ -2 \\ 4 \end{pmatrix}$$

## Länge eines Vektors - 3D

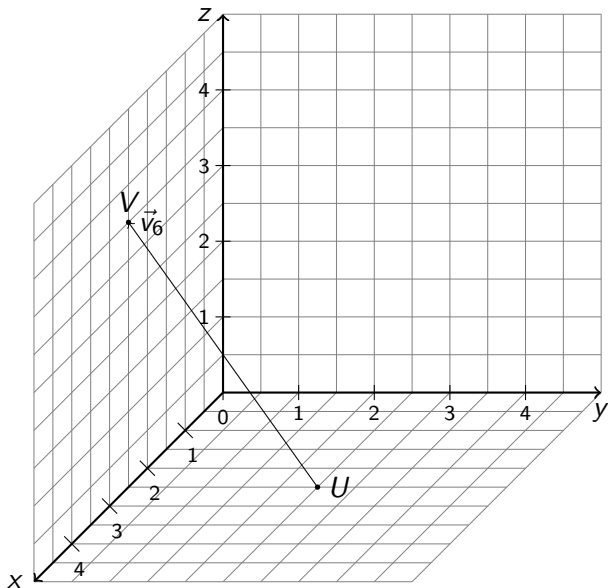


$$U = (1.5, 2, -0.5)$$

$$V = (2.5, 0, 3.5)$$

$$\vec{v}_6 = \begin{pmatrix} 2.5 - 1.5 \\ 0 - 2 \\ 3.5 - (-0.5) \end{pmatrix} = \begin{pmatrix} 1 \\ -2 \\ 4 \end{pmatrix}$$

## Länge eines Vektors - 3D

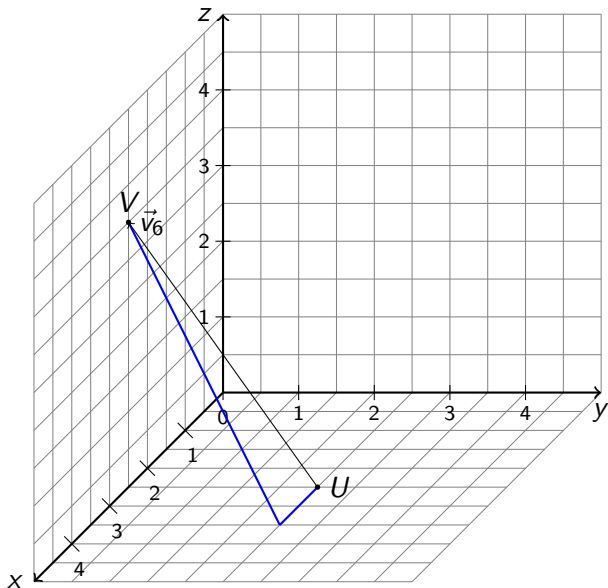


$$U = (1.5, 2, -0.5)$$

$$V = (2.5, 0, 3.5)$$

$$\vec{v}_6 = \begin{pmatrix} 2.5 - 1.5 \\ 0 - 2 \\ 3.5 - (-0.5) \end{pmatrix} = \begin{pmatrix} 1 \\ -2 \\ 4 \end{pmatrix}$$

## Länge eines Vektors - 3D

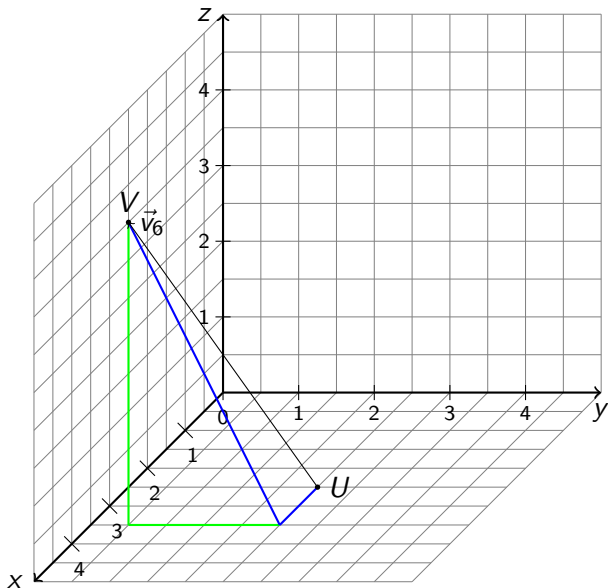


$$U = (1.5, 2, -0.5)$$

$$V = (2.5, 0, 3.5)$$

$$\vec{v}_6 = \begin{pmatrix} 2.5 - 1.5 \\ 0 - 2 \\ 3.5 - (-0.5) \end{pmatrix} = \begin{pmatrix} 1 \\ -2 \\ 4 \end{pmatrix}$$

## Länge eines Vektors - 3D

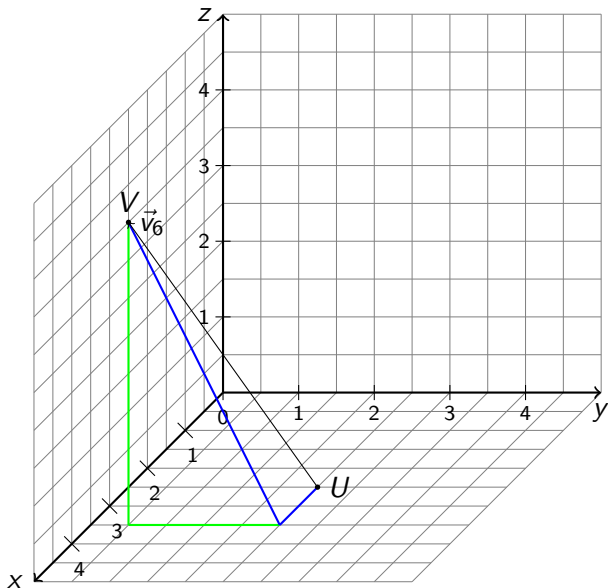


$$U = (1.5, 2, -0.5)$$

$$V = (2.5, 0, 3.5)$$

$$\vec{v}_6 = \begin{pmatrix} 2.5 - 1.5 \\ 0 - 2 \\ 3.5 - (-0.5) \end{pmatrix} = \begin{pmatrix} 1 \\ -2 \\ 4 \end{pmatrix}$$

## Länge eines Vektors - 3D



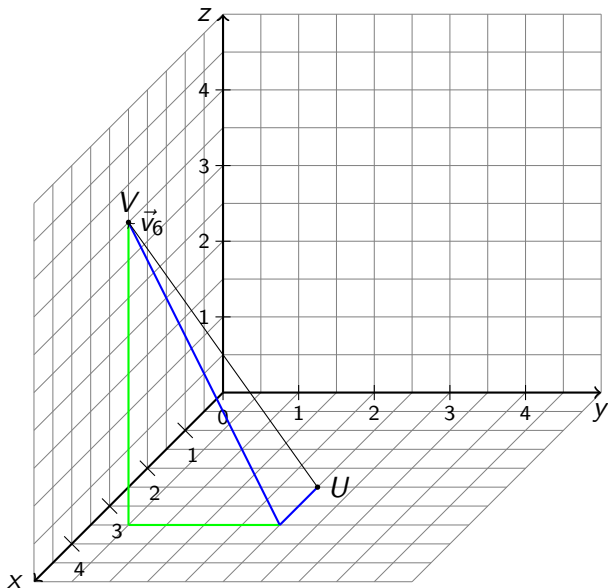
$$U = (1.5, 2, -0.5)$$

$$V = (2.5, 0, 3.5)$$

$$\vec{v}_6 = \begin{pmatrix} 2.5 - 1.5 \\ 0 - 2 \\ 3.5 - (-0.5) \end{pmatrix} = \begin{pmatrix} 1 \\ -2 \\ 4 \end{pmatrix}$$

$$|\vec{v}_6| = \sqrt{x^2 + \left| \begin{pmatrix} 0 \\ y \\ z \end{pmatrix} \right|^2}$$

## Länge eines Vektors - 3D



$$U = (1.5, 2, -0.5)$$

$$V = (2.5, 0, 3.5)$$

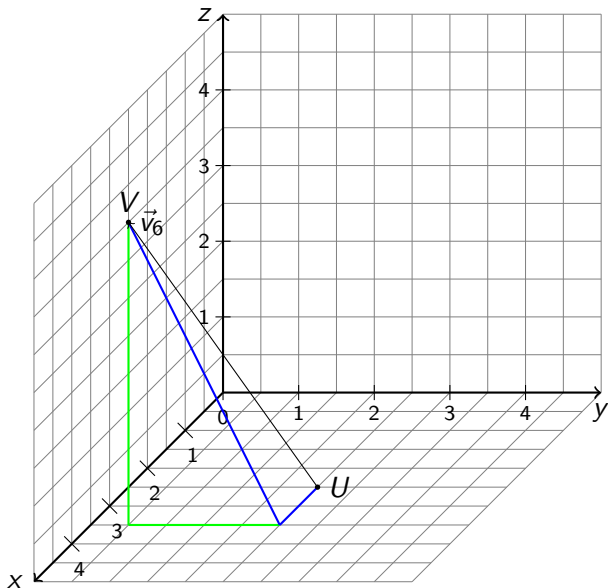
$$\vec{v}_6 = \begin{pmatrix} 2.5 - 1.5 \\ 0 - 2 \\ 3.5 - (-0.5) \end{pmatrix} = \begin{pmatrix} 1 \\ -2 \\ 4 \end{pmatrix}$$

$$|\vec{v}_6| = \sqrt{x^2 + \left| \begin{pmatrix} 0 \\ y \\ z \end{pmatrix} \right|^2}$$

$$|\vec{v}_6| = \sqrt{x^2 + \sqrt{y^2 + z^2}^2}$$



## Länge eines Vektors - 3D



$$U = (1.5, 2, -0.5)$$

$$V = (2.5, 0, 3.5)$$

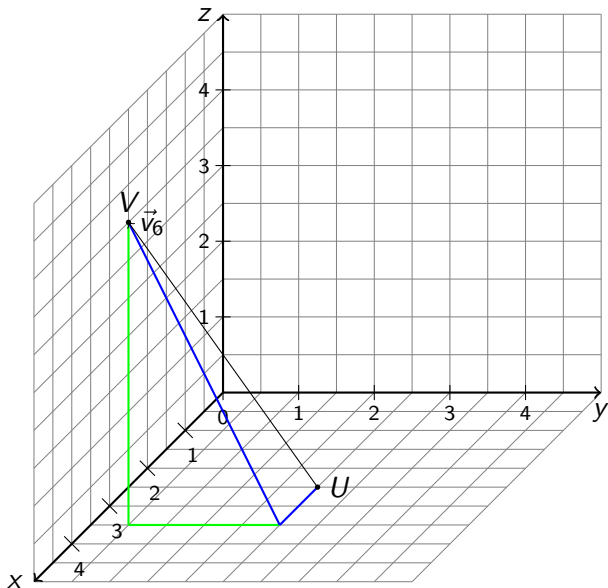
$$\vec{v}_6 = \begin{pmatrix} 2.5 - 1.5 \\ 0 - 2 \\ 3.5 - (-0.5) \end{pmatrix} = \begin{pmatrix} 1 \\ -2 \\ 4 \end{pmatrix}$$

$$|\vec{v}_6| = \sqrt{x^2 + \left| \begin{pmatrix} 0 \\ y \\ z \end{pmatrix} \right|^2}$$

$$|\vec{v}_6| = \sqrt{x^2 + \sqrt{y^2 + z^2}^2}$$

$$|\vec{v}_6| = \sqrt{x^2 + y^2 + z^2}$$

## Länge eines Vektors - 3D



$$U = (1.5, 2, -0.5)$$

$$V = (2.5, 0, 3.5)$$

$$\vec{v}_6 = \begin{pmatrix} 2.5 - 1.5 \\ 0 - 2 \\ 3.5 - (-0.5) \end{pmatrix} = \begin{pmatrix} 1 \\ -2 \\ 4 \end{pmatrix}$$

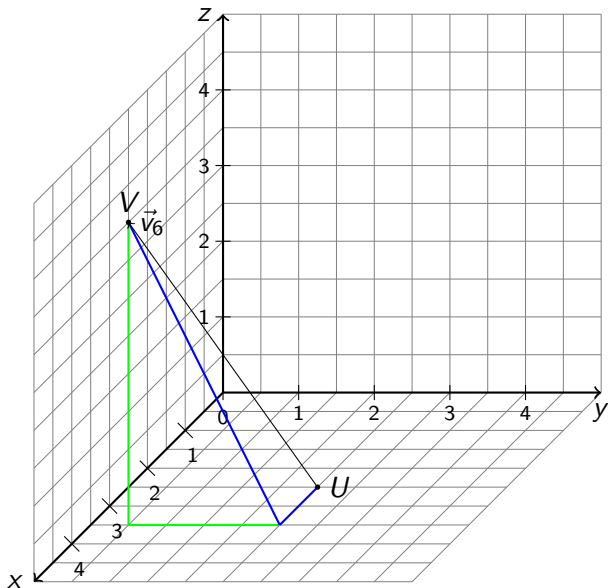
$$|\vec{v}_6| = \sqrt{x^2 + \left| \begin{pmatrix} 0 \\ y \\ z \end{pmatrix} \right|^2}$$

$$|\vec{v}_6| = \sqrt{x^2 + \sqrt{y^2 + z^2}^2}$$

$$|\vec{v}_6| = \sqrt{x^2 + y^2 + z^2}$$

$$|\vec{v}_6| = \sqrt{1^2 + (-2)^2 + 4^2}$$

## Länge eines Vektors - 3D



$$U = (1.5, 2, -0.5)$$

$$V = (2.5, 0, 3.5)$$

$$\vec{v}_6 = \begin{pmatrix} 2.5 - 1.5 \\ 0 - 2 \\ 3.5 - (-0.5) \end{pmatrix} = \begin{pmatrix} 1 \\ -2 \\ 4 \end{pmatrix}$$

$$|\vec{v}_6| = \sqrt{x^2 + \left| \begin{pmatrix} 0 \\ y \\ z \end{pmatrix} \right|^2}$$

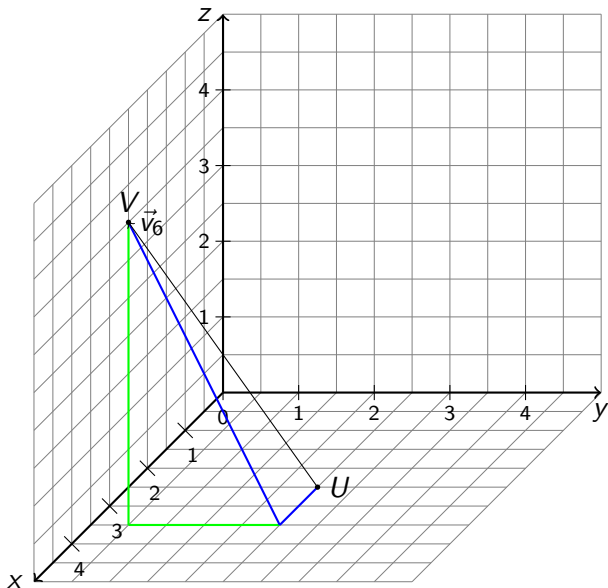
$$|\vec{v}_6| = \sqrt{x^2 + \sqrt{y^2 + z^2}^2}$$

$$|\vec{v}_6| = \sqrt{x^2 + y^2 + z^2}$$

$$|\vec{v}_6| = \sqrt{1^2 + (-2)^2 + 4^2}$$

$$|\vec{v}_6| = \sqrt{1 + 4 + 16}$$

## Länge eines Vektors - 3D



$$U = (1.5, 2, -0.5)$$

$$V = (2.5, 0, 3.5)$$

$$\vec{v}_6 = \begin{pmatrix} 2.5 - 1.5 \\ 0 - 2 \\ 3.5 - (-0.5) \end{pmatrix} = \begin{pmatrix} 1 \\ -2 \\ 4 \end{pmatrix}$$

$$|\vec{v}_6| = \sqrt{x^2 + \left| \begin{pmatrix} 0 \\ y \\ z \end{pmatrix} \right|^2}$$

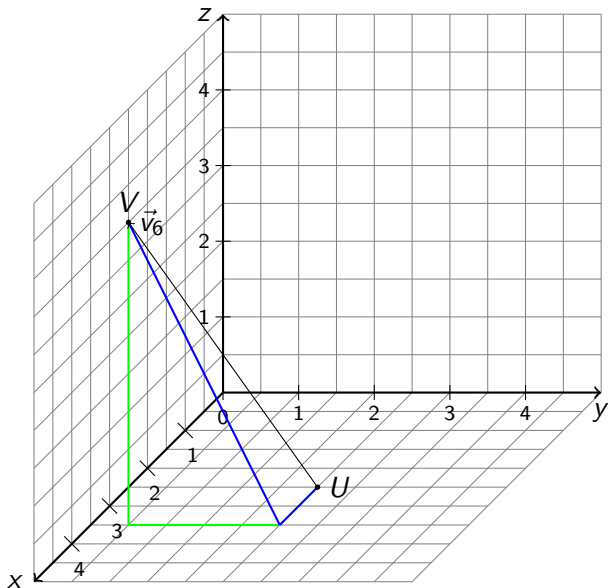
$$|\vec{v}_6| = \sqrt{x^2 + \sqrt{y^2 + z^2}^2}$$

$$|\vec{v}_6| = \sqrt{x^2 + y^2 + z^2}$$

$$|\vec{v}_6| = \sqrt{1^2 + (-2)^2 + 4^2}$$

$$|\vec{v}_6| = \sqrt{1 + 4 + 16} = \sqrt{21}$$

## Länge eines Vektors - 3D



$$U = (1.5, 2, -0.5)$$

$$V = (2.5, 0, 3.5)$$

$$\vec{v}_6 = \begin{pmatrix} 2.5 - 1.5 \\ 0 - 2 \\ 3.5 - (-0.5) \end{pmatrix} = \begin{pmatrix} 1 \\ -2 \\ 4 \end{pmatrix}$$

$$|\vec{v}_6| = \sqrt{x^2 + \left| \begin{pmatrix} 0 \\ y \\ z \end{pmatrix} \right|^2}$$

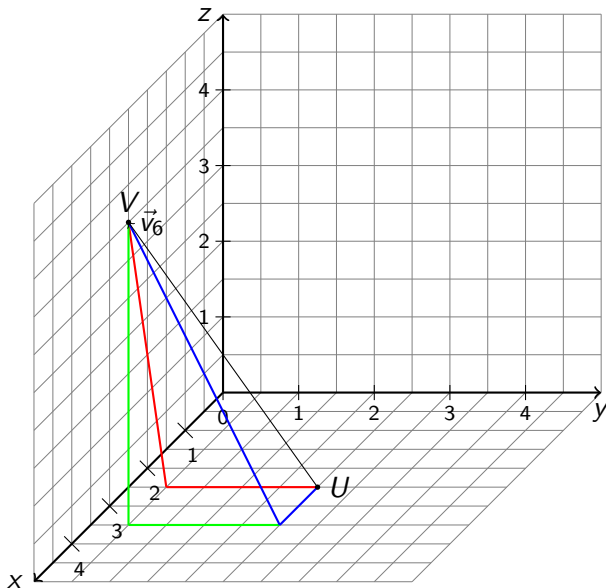
$$|\vec{v}_6| = \sqrt{x^2 + \sqrt{y^2 + z^2}^2}$$

$$|\vec{v}_6| = \sqrt{x^2 + y^2 + z^2}$$

$$|\vec{v}_6| = \sqrt{1^2 + (-2)^2 + 4^2}$$

$$|\vec{v}_6| = \sqrt{1 + 4 + 16} = \sqrt{21} \approx 4.5826$$

## Länge eines Vektors - 3D



$$U = (1.5, 2, -0.5)$$

$$V = (2.5, 0, 3.5)$$

$$\vec{v}_6 = \begin{pmatrix} 2.5 - 1.5 \\ 0 - 2 \\ 3.5 - (-0.5) \end{pmatrix} = \begin{pmatrix} 1 \\ -2 \\ 4 \end{pmatrix}$$

$$|\vec{v}_6| = \sqrt{x^2 + \left| \begin{pmatrix} 0 \\ y \\ z \end{pmatrix} \right|^2}$$

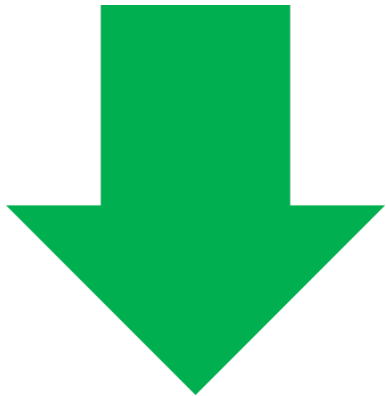
$$|\vec{v}_6| = \sqrt{x^2 + \sqrt{y^2 + z^2}^2}$$

$$|\vec{v}_6| = \sqrt{x^2 + y^2 + z^2}$$

$$|\vec{v}_6| = \sqrt{1^2 + (-2)^2 + 4^2}$$

$$|\vec{v}_6| = \sqrt{1 + 4 + 16} = \sqrt{21} \approx 4.5826$$







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Skype: JeanHilftDir

