课程概览：

MAT188 → 新

MAT188 → 理论

MAT188 → 体系

Note

Key Point

Vector Equation of a line

形式：

含义：

Parametric Equation形式：

和Vector Equa的转换：

考点1：Vector， Vector Equation and Parametric Equation

给定条件求对应Vector / Parametric Equation

题型1： 给定方向向量d，和直线上任意一点，求直线Vector Equation

A7 Write a vector equation of the line passing through the given points with the given direction vector.

(a) $P(3,4)$, $\vec{d} = \begin{bmatrix} -5 \\ 1 \end{bmatrix}$

(b) $P(2,3)$, $\vec{d} = \begin{bmatrix} -4 \\ -6 \end{bmatrix}$

(c) $P(2,0,5)$, $\vec{d} = \begin{bmatrix} 4 \\ -2 \\ -11 \end{bmatrix}$

(d) $P(4,1,5)$, $\vec{d} = \begin{bmatrix} -2 \\ 1 \\ 2 \end{bmatrix}$

Key Point

各题型对应解法:

1.______________________

____

____

____

2.______________________

____

____

____

____

3.______________________

____

____

____

____

____

题型2：给定直线方程的一般形式，改写成Vector Equation形式

A9 For each of the following lines in $\mathbb{R}^2$, determine a vector equation and parametric equations.

(a) $x_2 = 3x_1 + 2$

(b) $2x_1 + 3x_2 = 5$

题型3： 给定两点坐标，求经过该两点的直线的Vector Equation

Key Point

Norm :________________

Unit Vector:

____

Dot Product

定义:

____

其他形式:

____

公式变形:

____

几何意义:

____

____

考点2 Dot Product / 夹角问题

A triangle is defined by the three points:

$A = (6, 7)$

$B = (9, 6)$

$C = (5, 5)$

Determine all three angles in the triangle (in radians).

θ_a = ______

θ_b = ______

θ_c = ______

Key Point

如何确定一个平面?

平面一般方程：(*证明)

题型对应解法：

***考点3 平面相关问题 (Mainly in R3)**

题型1： 给定Normal和平面上一点，求平面一般方程/

A7 Find a scalar equation of the plane that contains the given point with the given normal vector.

(a) $P(-1, 2, -3)$, $\vec{n} = \begin{bmatrix} 2 \\ 4 \\ -1 \end{bmatrix}$

(b) $P(2, 5, 4)$, $\vec{n} = \begin{bmatrix} 3 \\ 0 \\ 5 \end{bmatrix}$

(c) $P(1, -1, 1)$, $\vec{n} = \begin{bmatrix} 3 \\ -4 \\ 1 \end{bmatrix}$

(d) $P(2, 1, 1)$, $\vec{n} = \begin{bmatrix} -4 \\ -2 \\ -2 \end{bmatrix}$

Key Point

Projection(投影)：

向量在向量上的Projection：

____

____

____

Proj 长度： ______________

Perpendicular Vector:

____

____

Perp 长度： ___________

____

向量在平面上的投影：

____

____

题型2 Projection and Minimum Distance

A6 Use a projection to find the distance from the point to the plane.

(a) $Q(2, 3, 1)$, plane $3x_1 - x_2 + 4x_3 = 5$

(b) $Q(-2, 3, -1)$, plane $2x_1 - 3x_2 - 5x_3 = 5$

(c) $Q(0, 2, -1)$, plane $2x_1 - x_3 = 5$

(d) $Q(-1, -1, 1)$, plane $2x_1 - x_2 - x_3 = 4$

解法总结：

综合灵活应用 —»

Key Point

Cross Product(叉乘)

定义及方法

几何意义及长度

D5 (a) Let $\vec{u} = \begin{bmatrix} 1 \\ 1 \\ -1 \end{bmatrix}$ and $\vec{x} = \begin{bmatrix} 2 \\ 5 \\ 3 \end{bmatrix}$. Show that $\text{proj}_{\vec{u}}(\text{perp}_{\vec{u}}(\vec{x})) = \vec{0}$.

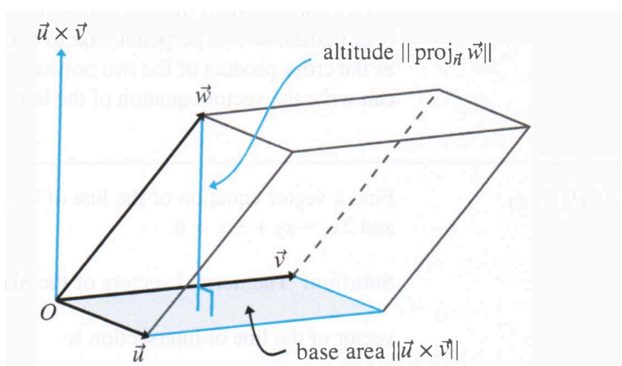
(b) For any $\vec{u} \in \mathbb{R}^3$, prove algebraically that for any $\vec{x} \in \mathbb{R}^3$, $\text{proj}_{\vec{u}}(\text{perp}_{\vec{u}}(\vec{x})) = \vec{0}$.

(c) Explain geometrically why $\text{proj}_{\vec{u}}(\text{perp}_{\vec{u}}(\vec{x})) = \vec{0}$ for every $\vec{x}$.

考点4 Cross Product

题型1：Cross product计算与方向判断 (多练习)

题型2：求解平行四边形面积和parallelepiped体积



Key Point

题型3 解法归纳

题型3 在求解平面上的应用——给定三点，求平面

A5 Determine the scalar equation of the plane that contains each set of points.

(a) $P(2,1,5)$, $Q(4,-3,2)$, $R(2,6,-1)$

(b) $P(3,1,4)$, $Q(-2,0,2)$, $R(1,4,-1)$

(c) $P(-1,4,2)$, $Q(3,1,-1)$, $R(2,-3,-1)$

(d) $P(1,0,1)$, $Q(-1,0,1)$, $R(0,0,0)$

题型4 给定Vector Equation，求Scalar equation

题型4 解法归纳

A4 Determine the scalar equation of the plane with vector equation

(a) $\vec{x} = \begin{bmatrix}1\\4\\7\end{bmatrix} + s\begin{bmatrix}2\\3\\-1\end{bmatrix} + t\begin{bmatrix}4\\1\\0\end{bmatrix}$

(b) $\vec{x} = \begin{bmatrix}2\\3\\-1\end{bmatrix} + s\begin{bmatrix}1\\1\\0\end{bmatrix} + t\begin{bmatrix}-2\\1\\2\end{bmatrix}$

(c) $\vec{x} = \begin{bmatrix}1\\-1\\3\end{bmatrix} + s\begin{bmatrix}2\\-2\\1\end{bmatrix} + t\begin{bmatrix}0\\3\\1\end{bmatrix}$

(d) $\vec{x} = s\begin{bmatrix}1\\3\\2\end{bmatrix} + t\begin{bmatrix}-2\\4\\-3\end{bmatrix}$