

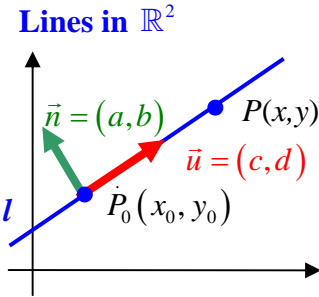
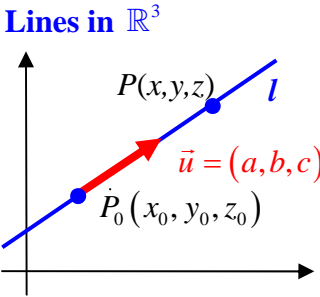
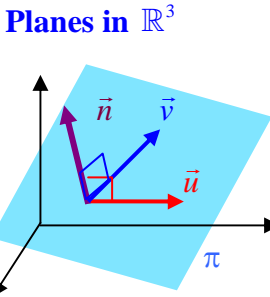
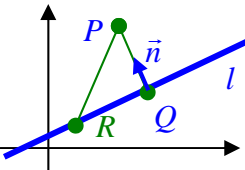
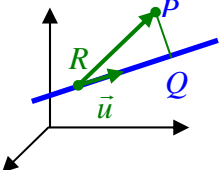
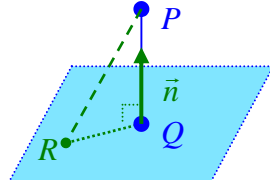
MATHEMATICS 201-NYC-05

Vectors and Matrices

Martin Huard

Fall 2007

Lines and Planes

	Lines in \mathbb{R}^2	Lines in \mathbb{R}^3	Planes in \mathbb{R}^3
Equation			
<i>Vector</i>	$P = P_0 + t\vec{u}$	$P = P_0 + t\vec{u}$	$P = P_0 + s\vec{u} + t\vec{v}$
<i>Parametric</i>	$\begin{cases} x = x_0 + ct \\ y = y_0 + dt \end{cases}$	$\begin{cases} x = x_0 + at \\ y = y_0 + bt \\ z = z_0 + ct \end{cases}$	$\begin{cases} x = x_0 + u_1s + v_1t \\ y = y_0 + u_2s + v_2t \\ z = z_0 + u_3s + v_3t \end{cases}$
<i>Symmetric</i>	$\frac{x - x_0}{c} = \frac{y - y_0}{d}$	$\frac{x - x_0}{a} = \frac{y - y_0}{b} = \frac{z - z_0}{c}$	□
<i>General</i>	$ax + by = e$		$ax + by + cz = d$
Relative Position	$L_1 \parallel L_2$ distinct $L_1 \parallel L_2$ identical concurrent	$L_1 \parallel L_2$ distinct $L_1 \parallel L_2$ identical $L_1 \not\parallel L_2$ skew $L_1 \not\parallel L_2$ concurrent	$L_1 \parallel L_2$ distinct $L_1 \parallel L_2$ identical $L_1 \not\parallel L_2$
Angle	$\cos \theta = \frac{ \vec{u}_1 \cdot \vec{u}_2 }{\ \vec{u}_1\ \ \vec{u}_2\ }$	$\cos \theta = \frac{ \vec{u}_1 \cdot \vec{u}_2 }{\ \vec{u}_1\ \ \vec{u}_2\ }$	$\cos \theta = \frac{ \vec{n}_1 \cdot \vec{n}_2 }{\ \vec{n}_1\ \ \vec{n}_2\ }$
Distance			
<i>To a point P</i>	$\overline{PQ} = \text{proj}_{\vec{n}} \overline{PR}$ $d = \ \overline{PQ}\ = \frac{ \overline{PR} \cdot \vec{n} }{\ \vec{n}\ }$	$\overline{RQ} = \text{proj}_{\vec{u}} \overline{RP}$ $d = \frac{\ \overline{PR} \times \vec{u}\ }{\ \vec{u}\ }$	$\overline{PQ} = \text{proj}_{\vec{n}} \overline{PR}$ $d = \ \overline{PQ}\ = \frac{ \overline{PR} \cdot \vec{n} }{\ \vec{n}\ }$
<i>Between Parallel</i>	$d = \frac{ \overline{P_1P_2} \cdot \vec{n} }{\ \vec{n}\ }$	$d = \frac{\ \overline{P_1P_2} \times \vec{u}\ }{\ \vec{u}\ }$	$d = \frac{ \overline{P_1P_2} \cdot \vec{n} }{\ \vec{n}\ }$
<i>Nonparallel</i>		$d = \frac{ \overline{P_1P_2} \cdot (\vec{u}_1 \times \vec{u}_2) }{\ \vec{u}_1 \times \vec{u}_2\ }$	

