Brebeuf College — Vectors: Points-Lines-Planes — Mr. Ryan

R^2 – 2 Dimensions	R^3 – 3 Dimensions
• $P_1 (x_1 , y_1)$ • $P_2 (x_2 , y_2)$ VL_1: $(x , y) = (x_1 , y_1) + a (m_1 , m_2)$ VL_2: $(x , y) = (x_2 , y_2) + b (m_3 , m_4)$ CL_1: $A_1x + B_1y + C_1=0$ CL_2: $A_2x + B_2y + C_2=0$	• $P_1 (x_1 , y_1 , z_1)$ • $P_2 (x_2 , y_2 , z_2)$ VL_1: $(x , y , z) = (x_1 , y_1 , z_1) + a (m_1 , m_2 , m_3)$ VL_2: $(x , y , z) = (x_2 , y_2 , z_2) + b (m_4 , m_5 , m_6)$ CP_1: $A_1x + B_1y + C_1z + D_1 = 0$ CP_2: $A_2x + B_2y + C_2z + D_2 = 0$ VP_1: $(x , y , z) = (x_1 , y_1 , z_1) + s (a_1 , a_2 , a_3) + t (b_1 , b_2 , b_3)$ VP_2: $(x , y , z) = (x_2 , y_2 , z_2) + p (a_4 , a_5 , a_6) + q (b_4 , b_5 , b_6)$

Formulas:

1a) $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$	**1b**) $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}$
2a) $d = \frac{\lvert Ax_1 + By_1 + C \rvert}{\sqrt{A^2 + B^2}}$	**2b**) $d = \frac{\lvert Ax_1 + By_1 + Cz_1 + D \rvert}{\sqrt{A^2 + B^2 + C^2}}$
3a) $d = \frac{\lvert C_2 - C_1 \rvert}{\sqrt{A^2 + B^2}}$	**3b**) $d = \frac{\lvert D_2 - D_1 \rvert}{\sqrt{A^2 + B^2 + C^2}}$
4) $d = \left\lvert \frac{\overrightarrow{P_1P_2} \cdot \vec{n}}{\lvert \vec{n} \rvert} \right\rvert$	**5**) $d = \frac{\lvert \overrightarrow{P_1P_2}\ x\ \vec{m} \rvert}{\lvert \vec{m} \rvert}$
6a) $\cos(\theta) = \frac{\overrightarrow{n_1} \cdot \overrightarrow{n_2}}{\lvert n_1 \rvert \lvert n_2 \rvert})$	**6b**) $\cos(\theta) = \frac{\overrightarrow{m_1} \cdot \overrightarrow{m_2}}{\lvert m_1 \rvert \lvert m_2 \rvert}$

Distance

$P_1 – P_2$ $P_1 – VL_2$ $P_1 – CL_2$ $VL_1 – VL_2$ $VL_1 – CL_2$ $CL_1 – CL_2$	$P_1 – P_2$ $P_1 – VL_2$ $P_1 – CP_2$ $P_1 – VP_2$ $VL_1 – VL_2$ (Parallel) $VL_1 – VL_2$ (Skew) $VL_1 – CP_2$ $VL_1 – VP_2$ $CP_1 – CP_2$ $CP_1 – VP_2$ $VP_1 – VP_2$

Intersection

$VL_1 – VL_2$ $VL_1 – CL_2$ $CL_1 – CL_2$	$VL_1 – VL_2$ $VL_1 – CP_2$ $VL_1 – VP_2$ $CP_1 – CP_2$ $CP_1 – VP_2$ $VP_1 – VP_2$

Angle

$VL_1 – VL_2$ $VL_1 – CL_2$ $CL_1 – CL_2$	$VL_1 – VL_2$ $VL_1 – CP_2$ $VL_1 – VP_2$ $CP_1 – CP_2$ $CP_1 – VP_2$ $VP_1 – VP_2$