

Instructions

- Answer each question completely; justify your answers.
 - This assignment is due at 3:00 pm on Friday March 28, 2003.
 - Please place your completed assignment in Box 35.
1. Let P_1 and P_2 be two points in $P_2(\mathbb{R})$. Clearly P_i cannot have coordinates $(0, 0)$ with respect to any ordered basis for the line P_1P_2 . Thus there exists an ordered basis $B = \{B_1, B_2\}$ for P_1P_2 such that P_i has coordinates (s_i, t_i) with respect to B , and such that $s_1 \neq 0$.

It follows that s_2 must be some scalar multiple of s_1 , say $s_2 = ks_1$.

Prove that P_1 and P_2 are the same point of $P_2(\mathbb{R})$ if and only if $\begin{vmatrix} s_1 & t_1 \\ s_2 & t_2 \end{vmatrix} = 0$.

2. Let L_1, L_2 , and L_3 be the lines $x = 8$, $y = -3$, and $3x - 7y = 12$, respectively, in \mathbb{R}^2 .
- (a) What are the coordinates of each line?
 - (b) What is the equation for the point of intersection of L_1 and L_2 ?
 - (c) What is the equation for the point of intersection of L_1 and L_3 ?
 - (d) What is the equation for the point of intersection of L_2 and L_3 ?
3. Let $P = (4, 5)$, $Q = (2, -4)$, and $R = (-3, 17)$ be points of \mathbb{R}^2 .
- (a) Are these three points collinear?
 - (b) What are the equation and the coordinates of the line PQ ?
 - (c) What are the equation and the coordinates of the line PR ?
 - (d) What are the equation and the coordinates of the line QR ?
4. Let $P = (3, 4, 0)$, $Q = (16, 20, -6)$, and $R = (1, 2, 3)$ be points of $P_2(\mathbb{R})$.
- (a) What are the coordinates of each point, expressed in standard form?
 - (b) Are these points collinear?
 - (c) What are the equation and the coordinates of the line PQ ?
5. Let $L_1 = [2, 1, 0]$, $L_2 = [3, 0, 1]$ and $L_3 = [0, -2, 1]$ be lines of $P_2(\mathbb{R})$.
- (a) Do the three lines intersect in a common point?
 - (b) What is the point of intersection of L_1 and L_2 ?
 - (c) What is the point of intersection of L_1 and L_3 ?
 - (d) What is the point of intersection of L_2 and L_3 ?
6. Let $L_1 = [4, 0, 1]$, $L_2 = [5, 4, 1]$ and $L_3 = [0, -16, 1]$ be lines of $P_2(\mathbb{R})$.
- (a) Do the three lines intersect in a common point?
 - (b) What is the point of intersection of L_1 and L_2 ?
 - (c) What is the point of intersection of L_1 and L_3 ?
 - (d) What is the point of intersection of L_2 and L_3 ?