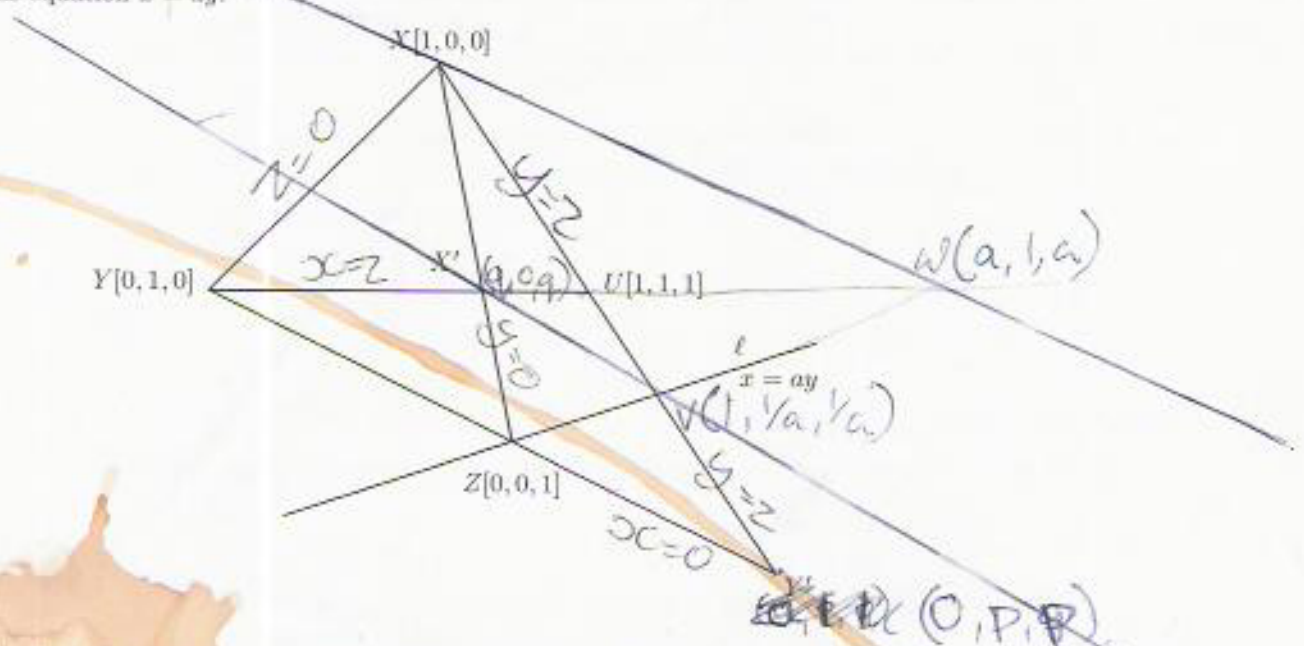


Question 4 (Unit 4) — 20 marks

In this question the Points X, Y, Z and U denote the triangle of reference and the unit Point. X' is the Point of intersection of the Lines ZX and UY , and Y' is the Point of intersection of the Lines ZY and UX . The Line l passes through Z and has equation $x = ay$.



- Find the coordinates of the Points V and W , where l intersects XY' and $X'Y$ respectively. [3]
- Write down the equations of the Lines XY and $X'Y'$, and hence find the coordinates of A , their Point of intersection. [3]
- Find the coordinates of the Point B , where the Lines $X'V$ and XW intersect, and of the Point C , where the Lines YV and $Y'W$ intersect. [5]
- Show that the Points A, B and C are collinear, and find the equation of the Line through A, B and C . [3]
- Show that the Line through A, B and C also passes through U , and find the cross-ratio $(ABCU)$. [6]

Question 5 (Unit 5) — 20 marks

- In this part of the question E is the plane conic with equation

$$3x^2 - 2xy + 3y^2 + 2x - 6y + 2 = 0.$$

- Determine the ratios in which E divides the line segment from $(-1, 0)$ to $(3, 4)$. [3]
- Use your answer to part (i) to show that of the two points, where E cuts the line from $(-1, 0)$ to $(3, 4)$, the point nearer to $(-1, 0)$ has coordinates $(-\frac{1}{2}, \frac{1}{2})$. [3]
- Find the equation of the tangent to E at $(-\frac{1}{2}, \frac{1}{2})$. [3]

- In this part of the question, E' is the projective conic

$$3x^2 - 2xy + 3y^2 + 2xz - 6yz + 2z^2 = 0.$$

- Find the equation of the tangent to E' at the Point $[-1, 1, 2]$. [3]
- Verify that the tangent you found in part (b)(i) passes through the Point $[1, -1, 0]$, and find the other tangent to E' from this Point. [4]

Part b(iii) on facing page.