Linear transformations

Answers

Further Maths topic practice

This topic online

Q	Answer	Marks
1	**a)** (0, -1; 1, 0) **b)** (0, -1; -1, 0) **c)** (1, 0; 0, 4)	3
2	**a)** Reflection in the line y = x **b)** Rotation 240° anticlockwise (or 120° clockwise) about the origin **c)** Enlargement, scale factor -2, centre the origin	4
3	**a)** A'(-2, 2), B'(-2, 6), C'(-4, 2) **b)** 4 **c)** Rotation 90° anticlockwise about O combined with an enlargement, scale factor 2, centre O	5
4	**a)** P = (0, 1; -1, 0), Q = (0, -1; -1, 0) **b)** QP = (1, 0; 0, -1) **c)** Reflection in the x-axis	4
5	**a)** k = 4 **b)** det M = 14 is positive **c)** (1, 3)	6
6	Invariant points satisfy 3x - 2y = x and x = y, which both give y = x, so y = x is a line of invariant points	4
7	y = x and y = -2x	5
8	**a)** shown **b)** (8, 4) **c)** P(3, 2)	6
9	**a)** U = (1, 0, 0; 0, 0, -1; 0, 1, 0), V = (1, 0, 0; 0, 1, 0; 0, 0, -1) **b)** (1, 0, 0; 0, 0, -1; 0, -1, 0) **c)** (2, -3, 1) **d)** UV = (1, 0, 0; 0, 0, 1; 0, 1, 0) ≠ VU, so the order matters	6
10	**a)** Rotation of 60° anticlockwise about the z-axis **b)** (1, √3, 5) **c)** $(\frac{1}{2}, \frac{\sqrt{3}}{2}, 0; -\frac{\sqrt{3}}{2}, \frac{1}{2}, 0; 0, 0, 1)$: rotation 60° clockwise about the z-axis **d)** n = 6	6
11	**a)** (0, 1; 3, 0) **b)** O(0, 0), A'(0, 6), B'(2, 9), C'(2, 3) **c)** 12 **d)** $(0, \frac{1}{3}; 1, 0)$: reflection in y = x, then a stretch parallel to the x-axis, scale factor $\frac{1}{3}$	8
12	**a)** M^2 = I: doing T twice returns every point to where it started (T is its own inverse) **b)** M(x, x) = (x, x) **c)** y = x, and y = 3x + c for every value of c	8

Full worked solutions, written out by hand, are on the solutions sheet for this topic.

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