| **Question** | **Scheme** | **Marks** |
| --- | --- | --- |
| **1** |  |  |
| det**M** = *x*(4*x* – 11) – (3*x* – 6)(*x* – 2) | M1 |
| *x*2 + *x* – 12 (=0) | A1 |
| (*x* + 4)(*x* – 3) (= 0 )🡪 *x* = ... | M1 |
|    | A1 |
|  |  | **(4 marks)** |
| **2(a)** |  |  |
|  | M1 A1 |
|  |  | **(2)** |
| **2(b)** |   |  |
|  |  |
|  | M1 |
|  | A1 A1 |
|  |  | **(3)** |
|  |  | **(5 marks)** |
| **3(i)(a)** |  |  |
|  | M1 |
| ` | A1 |
|  |  | **(2)** |
| **3(i)(b)** | **B** is singular   |  |
|   | M1 |
|   |  |
|   | A1cao |
|  |  | **(2)** |
| **3(ii)** |  |  |
|  | M1 |
|  |  | A1 |
|  |  | **(2)** |
|  |   | **(6 marks)** |
| **4(a)** |  |  |
|   | M1 |
|   | A1 |
|  |  | **(2)** |
| **4(b)** | where *k* is a constant, |  |
|  | M1 |
| **E** does not have an inverse   |  |
|  | M1 |
|  | M1 |
|  |  |
|  | A1 oe |
|  |  | **(4)** |
|  |  | **(6 marks)** |
| **5(a)** |  |  |  |
|  |  |  |
|   | A correct method to multiply out two matrices. Can be implied by two out of four correct elements. | M1 |
|   | Any three elements correct | A1 |
|  | Correct answer | A1 |
|  |  | Correct answer only 3/3 | **(3)** |
| **5(b)** | Reflection; about the *y*-axis. | Reflection  | M1 |
|  | *y*-axis (or .) | A1 |
|  |  |  | **(2)** |
| **5(c)** |  |  or **I**  | B1 |
|  |  |  | **(1)** |
|  |  |  | **(6 marks)** |
| **6(a)(i)** | **A** =  |  |  |
| **A**2 =  |  |  |
|  =  | A correct method to multiply out two matrices. Can be implied by two out of four correct elements. | M1 |
|   | Correct answer | A1 |
|  |  |  | **(2)** |
| **6(a)(ii)** | **Enlargement**; scale factor 3, centre  | **Enlargement**;scale factor **3**, centre **(0, 0)** | B1B1 |
|  |  |  | **(2)** |
| **6(b)** |  |  |  |
| Reflection; in the line  | **Reflection**;*y* = –*x* | B1B1 |
|  |  |  | **(2)** |
| **6(c)** |  *k* is a constant. |  |  |
| **C** is singular   (Can be implied)  |   | B1 |
|   | Applies   | M1 |
|   |  |  |
|   |  |  |
|   |  | A1 |
|  |  |  | **(3)** |
|  |  | **(9 marks)** |
| **7(i)** | **A** =  , **B =**  |  |
|  | M1A2 |
|  | B1 |
|  |  | **(4)** |
| **7(ii)** |  | M1 |
|  | M1A1 |
|  |  | **(3)** |
|  |  | **(7 marks)** |
| **8(a)** |    | B1 |
|  |  | **(1)** |
| **8(b)** |   | B1 |
|  |  | **(1)** |
| **8(c)** |   | B1 |
|  |  | **(1)** |
| **8(d)** |    | M1 A1 cao |
|  |  | **(2)** |
| **8(e)** |  Reflection in the *y* axis | B1 B1 |
|  |  | **(2)** |
|  |  | **(7 marks)** |
| **9(a)** |  | Attempt to multiply the right way round with at least 4 correct elements | M1 |
| has coordinates (1,1), (1,2) and (4,2) or  **NOT just**  | Correct coordinates or vectors | A1 |
|  |  | **(2)** |
| **9(b)** | **Reflection** in the line ***y* = *x*** | Reflection | B1 |
| *y* = *x* | B1 |
| Allow ‘in the axis’ ‘about the line’ *y* = *x* etc. Provided both features are mentioned ignore any reference to the origin unless there is a clear contradiction. |  |
|  |  | **(2)** |
| **9(c)** |  | 2 correct elements | M1 |
| Correct matrix | A1 |
|  | **Note that  scores M0A0 in (c) but allow all the marks in (d) and (e)** |  |
|  |  | **(2)** |
| **9(d)** |  | “-2”×”2” – “0”×”0” | M1 |
|  | -4 | A1 |
|  | Answer only scores 2/2 **scores M0** | **(2)** |
| **9(e)** | Area of *T* =  | Correct area for T | B1 |
| Area of  | Attempt at  | M1 |
|  | 6 or follow through their det(QR) x Their triangle area provided area > 0 | A1ft |
|  |  | **(3)** |
|  |  | **(11 marks)** |
| **10(i)(a)** |  |  |
|  | M1 A1 |
|  |  | **(2)** |
| **10(i)(b)** |  |  |
|  |  |
|  |  |
| or  | M1 |
|  | A1 |
|  | M1 |
|  | A1 |
|  |  | **(4)** |
| **10(ii)** |   | B1 |
|  | M1 |
|  | M1 |
|  | A1 A1 |
|  |  | **(4)** |
|  |  | **(11 marks)** |
| **11(a)** | where *a* and *b* are constants**.** |  |  |
|  |  |  |
| Therefore,  | Using the information in the question to form the matrix equation. Can be implied by both correct equations below. | M1 |
| So,  and Allow  | Any one correct equation.Any correct horizontal line | M1 |
| giving  and  | Any one of  or  | A1 |
| Both  and  | A1 |
|  |  | **(4)** |
| **11(b)** |  | Finds determinant by applying   | M1 |
|  |  | A1 |
|  |  |  |
|  |  or   | M1 |
| 150 or ft answer | A1 |
|  |  |  **(4)** |
|  |  | **(8 marks)** |
| **12(a)** | **Rotation** ,135 degrees or radians (anticlockwise) about *O* or 225 degrees or  clockwise about *O.* | M1 A1 |
|  |  | **(2)** |
| **12(b)** |   |  |
|  or equivalent | M1 A1 |
|  *p =* –3and *q* = –9 or  | B1 cso |
|  |  | **(3)** |
| **12(c)** |  | B1 |
|  |  | **(1)** |
| **12(d)** |   | M1 A1A1 |
|  |  | **(3)** |
| **12(e)** |  **= R** |  |
|  | (so matrix is self inverse and so transformation is self inverse) | B1 |
|  |  | **(1)** |
|  |  | **(10 marks)** |
| **13(a)** |  | M1A1 |
|  | M1A1 |
|  |  |
|  | M1A1 |
|  |  | **(6)** |
| **13(b)** |  | B1 |
|  | M1 |
|  | dM1 |
|  | A1 |
|  |  | **(4)** |
|  |  | **(10 marks)** |

|  |  |  |  |  |  |
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|  | **Source paper** | **Question number** | **New spec references** | **Question description** | **New AOs** |
| 1 | FP1 2013 | 1 |   | Matrix algebra | 1.1b, 2.1, 3.1a |
| 2 | FP1 2017 | 2 |   | Matrix algebra |  1.1b, 2.1, 3.1a |
| 3 | FP1 2013R | 2 |   | Matrix algebra | 1.1b, 2.1, 3.1a |
| 4 | FP1 2012 | 2 |   | Matrix algebra | 1.1b, 2.1, 3.1a |
| 5 | FP1 2011 | 2 |   | Matrix algebra | 1.1b, 3.1a |
| 6 | FP1 2011 | 3 |   | Matrix algebra | 1.1b, 2.1, 3.1a |
| 7 | FP1 2014 | 4 |   | Matrix algebra | 1.1b, 2.4 |
| 8 | FP1 Jan 2013 | 4 |   | Matrix algebra | 1.1b, 2.1, 3.1a |
| 9 | FP1 Jan 2012 | 4 |   | Matrix algebra | 1.1b, 2.1, 3.1a |
| 10 | FP1 2017 | 5 |   | Matrix algebra | 11.1.2, 13.1.1 |
| 11 | FP1 2011 | 5 |   | Matrix algebra | 1.1b, 2.1, 3.1a |
| 12 | FP1 2016 | 6 |   | Matrix algebra | 1.1b, 2.1, 3.1a |
| 13 | FP1 2014R | 6 |   | Matrix algebra | 1.1b, 3.1a |