| **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)** | | B1  B1 |
|  |  |  | | **(2)** |
| **6(b)** |  |  | |  |
| Reflection; in the line | **Reflection**;  *y* = –*x* | | B1  B1 |
|  |  |  | | **(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 A1  A1 |
|  |  | | | **(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 |