| Question Number | Scheme | Marks |
|---|---|---|
| **5(a)** | Rotation... | M1 |
| | ...of $45^\circ$ or $\frac{\pi}{4}$ [or $315^\circ$ or $\frac{7\pi}{4}$ **clockwise**] about (0,0)/*O*/the origin | A1 |
| | | **(2)** |
| **(b)** | $\mathbf{B}=\begin{pmatrix}2\sqrt{2} & 0\\ 0 & 2\sqrt{2}\end{pmatrix}$ | B1 |
| | | **(1)** |
| **(c)** | $\mathbf{C}=\begin{pmatrix}2\sqrt{2} & 0\\ 0 & 2\sqrt{2}\end{pmatrix}\begin{pmatrix}\frac{1}{\sqrt{2}}+1 & -\frac{1}{\sqrt{2}}\\ \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}}+1\end{pmatrix}=\begin{pmatrix}2+2\sqrt{2} & -2\\ 2 & 2+2\sqrt{2}\end{pmatrix}$ **or** $\det\mathbf{B}=\left(2\sqrt{2}\right)\left(2\sqrt{2}\right)-(0)(0)=8$ **and** $\det(\mathbf{A}+I)=\left(\frac{1}{\sqrt{2}}+1\right)\left(\frac{1}{\sqrt{2}}+1\right)-\left(\frac{1}{\sqrt{2}}\right)\left(-\frac{1}{\sqrt{2}}\right)=2+\sqrt{2}$ | M1 |
| | $\det\mathbf{C}=\left(2+2\sqrt{2}\right)\left(2+2\sqrt{2}\right)-2(-2)$ **or** $8\left(2+\sqrt{2}\right)$ | M1 |
| | area of $T=\frac{12\left(1+\sqrt{2}\right)}{16+8\sqrt{2}}$ | M1 |
| | $\frac{3\sqrt{2}}{4}$ | A1 |
| | | **(4)** |
| | | **Total 7** |

**Notes**

**(a)**

M1: Identifies the transformation as a rotation.

A1: Fully correct description including angle and centre of rotation. Assume anticlockwise unless otherwise stated. Condone phrases such as "through the origin".

**(b)**

B1: Correct **B**

**(c)**

M1: Attempts **C** = **B**(**A**+**I**) – may use **BA** + **B** – **or** attempts both det **B** and det **A**+**I**. Must see evidence of the correct identity matrix. **See special case for use of C = (A + I)B**

M1: Attempts the determinant of their **C** or via the product of their det **B** and det **A**+**I**. May be implied by dividing by the two determinants in turn.

M1: Correct method for the area, $12\left(1+\sqrt{2}\right)\div\left|\text{their det}\mathbf{C}\right|$ - must be a positive value, but allow recovery if the make the answer positive in the final line.

A1: Any correct exact value in simplest form. Allow $\frac{3}{2\sqrt{2}}$

**SC**: Allow M0M1M1A1 if **C** = (**A** + **I**)**B** is clearly used, which gives the same **C** but from incorrect order of composition. But allow full marks bod in cases where it is unclear or approaches via finding the determinants first then multiplying them in any order.