

MA111 Tutorial Sheet 5 – Final Answer Key

1. (i) $\oint_{\partial R} F_1 dx + F_2 dy = \frac{31}{60} = \iint_R \left(\frac{\partial F_2}{\partial x} - \frac{\partial F_1}{\partial y} \right) dx dy.$
(ii) $\oint_{\partial R} F_1 dx + F_2 dy = 1 = \iint_R \left(\frac{\partial F_2}{\partial x} - \frac{\partial F_1}{\partial y} \right) dx dy.$
2. (i) -4
(ii) 4
(iii) -4π
3. (i) $\frac{3\pi a^2}{2}$
(ii) a^2
4. (i) $\frac{(3\pi - 8)a^2}{8}$
(ii) $3\pi a^2$
(iii) $\frac{3\pi - 8}{4}$
5. 0
8. 0
9. (iii) 0
10. (i) -2π
(ii) 0
(iii) $\oint_C \frac{\partial(\ln r)}{\partial y} dx - \frac{\partial(\ln r)}{\partial x} dy = \begin{cases} -2\pi, & \text{if } (0,0) \text{ lies in the interior of } C \text{ in } \mathbb{R}^2; \\ 0, & \text{otherwise.} \end{cases}$
11. (i) No
(ii) No