

5. Given that

$$f(x) = 2x + 3 + \frac{12}{x^2}, \quad x > 0$$

show that  $\int_1^{2\sqrt{2}} f(x) dx = 16 + 3\sqrt{2}$

(5)

$$\int_1^{2\sqrt{2}} 2x + 3 + 12x^{-2} \quad (1 \text{ mark})$$

$$= \left[ \frac{1}{2}(2)x^2 + 3x + (-1)12x^{-1} \right]_1^{2\sqrt{2}}$$

$$= \left[ x^2 + 3x - \frac{12}{x} \right]_1^{2\sqrt{2}} \quad (2 \text{ marks})$$

$$= \left[ (2\sqrt{2})^2 + 3(2\sqrt{2}) - \frac{12}{2\sqrt{2}} \right] - \left[ (1)^2 + 3(1) - \frac{12}{1} \right]$$

$$= [8 + 6\sqrt{2} - 3\sqrt{2}] - [1 + 3 - 12]$$

$$= [8 + 3\sqrt{2}] - [-8]$$

$$= 8 + 3\sqrt{2} + 8$$

$$= 16 + 3\sqrt{2} \quad (2 \text{ marks})$$

$$\frac{12}{2\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{12\sqrt{2}}{4} = 3\sqrt{2}$$