Solutions

Each answer shows the steps, then the **result**.

2.1

- $x = 2\cos\frac{\pi}{3} = 1$, $y = 2\sin\frac{\pi}{3} = \sqrt{3}$

2.2

- $A = \frac{1}{2}\displaystyle\int r^2\,d\theta$

3.1 B

- $r = 2\sin\theta \Rightarrow r^2 = 2r\sin\theta \Rightarrow x^2 + y^2 = 2y$, a circle

3.2

(a)

- $\cos\theta$ runs from -1 to 1, so $r_{\text{max}} = 5$ at $\theta = 0$ and $r_{\text{min}} = 1$ at $\theta = \pi$; the least value is $1 > 0$, so r is never 0 and the curve misses the pole

(b)

- $(3 + 2\cos\theta)^2 = 9 + 12\cos\theta + 4\cos^2\theta$, and $4\cos^2\theta = 2 + 2\cos 2\theta$, so the integrand is $11 + 12\cos\theta + 2\cos 2\theta$; $A = \frac{1}{2}\left[11\theta + 12\sin\theta + \sin 2\theta\right]_0^{2\pi}$; both sine terms vanish at 0 and 2π; $A = \frac{1}{2}(22\pi) = 11\pi$

3.3

- $r + r\cos\theta = 2 \Rightarrow r = 2 - x$ (since $r\cos\theta = x$); $r^2 = (2-x)^2 \Rightarrow x^2 + y^2 = 4 - 4x + x^2$; $y^2 = 4 - 4x$, i.e. $y^2 = -4(x-1)$