Section 2: The area of a sector

Exercise level 1

1. Find the area of one loop of each of the curves
   (i) $r = a\cos 3\theta$
   (ii) $r = a\sin 2\theta$.

2. Find the area enclosed by the spiral $r = ae^{\theta}$ from $\theta = 0$ to $\theta = \pi$.

3. Sketch each of the following curves, and find the total area enclosed by the curve.
   (i) $r = 1 + \sin\theta$
   (ii) $r = 3 - 2\cos\theta$
   (iii) $r^2 = a^2\cos 2\theta$

4. (i) Sketch the curve $r = 1 + 2\cos\theta$.
   (ii) Find the area enclosed by the inner loop of the curve.

5. Find the exact area bounded by the curve $r = \sqrt{\theta} + \frac{1}{\sqrt{\theta}}$ for $\pi \le \theta \le 2\pi$, the initial line, and the ray $\theta = \pi$.