1. Suppose you use Newton’s method with initial guess $x_1 = 3$ to find a solution to $e^x - 4x = 0$. What is $x_3$?

2. Match the polar equations (a) $r = 1 + \sin \theta$, (b) $r = \cos(4\theta)$, (c) $r = \sqrt{\theta}$, (d) $r = e^{-\theta}$ (all shown in the range $0 \leq \theta \leq 2\pi$) to the curves in Figure 1.

3. Figure 2 shows the region bounded by the polar curves $\theta = \pi/6, \theta = \pi/3$ and $r = \sqrt{1 - \frac{1}{2\theta}}$. Find the area of the region.

4. Each equation represents a sphere. What is the center and radius of the sphere?
Figure 2: Region in Problem 3.

(a) \( x^2 + (y + 4)^2 + (z - 1)^2 = 3 \)
(b) \( (x - 2)^2 + (y + 1)^2 + z^2 = 8 - 2z \)
(c) \( (x - y - z)^2 = 1 - 2(xy - yz + zx) \)

5. Let \( \mathbf{a} = (-2, 1, 0), \mathbf{b} = (1, -1, 3) \). Calculate

(a) \( |\mathbf{a}| \)
(b) \( |\mathbf{b}| \)
(c) \( \mathbf{a} - \mathbf{b} \)
(d) \( \mathbf{a} + 2\mathbf{b} \)
(e) \( \mathbf{a} \cdot \mathbf{b} \) (dot product)
(f) the angle \( \theta \) between \( \mathbf{a} \) and \( \mathbf{b} \).