

**Question 10**

Sketch, on three separate diagrams, each of the following Circles together with its image under inversion in the unit circle. If the image is a circle state its centre and radius.

- (a)  $S_1$ : the line  $y = 1$ .
- (b)  $S_2$ : the line  $x = 3$ .
- (c)  $S_3$ : the circle with centre  $(3, 0)$  and radius 2.

Mark each Circle carefully to distinguish it from its image.

[6]

**Question 11**

Use the Increasing-Decreasing Theorem to prove that

$$x^{3/4} \leq \frac{3}{4}x + \frac{1}{4}, \quad \text{for } x \in [0, 1].$$

[5]

**Question 12**

- (a) Determine the barrier lines (if any) for the flow with velocity function

$$V(x, y) = (2x + 3y, 2x + y)$$

and the direction of the flow on each barrier line.

- (b) Hence draw a rough sketch of the flow.

[5]