3. **In this question you must show all stages of your working.**
Solutions relying entirely on calculator technology are not acceptable.

At time $t = 0$, a particle P is at the fixed point O

At time t seconds, $t > 0$, P has position vector **r** metres relative to O, where

$$\mathbf{r} = \left(3t + 2 - 2\sqrt{t+1}\right)\mathbf{i} + \left(t^2 - 6t\right)\mathbf{j}$$

(a) Find the speed of P at the instant when P is moving in the direction of the vector **i**

(5)

(b) Find the magnitude of the acceleration of P when $t = 0.25$

(4)

(c) Show that P never returns to O

(2)

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

Question 3 continued

(Total for Question 3 is 11 marks)