1 The curve with equation $x^2 - x + y^2 = 10$ and the straight line with equation $x - y = -4$ intersect at the points A and B.

Work out the exact length of AB.

Show your working clearly and give your answer in the form $\frac{\sqrt{a}}{2}$ where a is an integer.

$x^2 - x + y^2 = 10$ — ①

$x - y = -4$ — ②

$x = y - 4$ — ③

substitute ③ into ①

$(y-4)^2 - (y-4) + y^2 = 10$ (1)

$y^2 - 8y + 16 - y + 4 + y^2 = 10$

$2y^2 - 9y + 20 = 10$

$2y^2 - 9y + 10 = 0$ (1)

$(2y-5)(y-2) = 0$ (1)

$y = 2.5$ or $y = 2$

substitute y into ③

$x = -1.5$ or $x = -2$

$(-1.5, 2.5)$ and $(-2, 2)$ (1)

length $: \sqrt{(-1.5-(-2))^2 + (2.5-2)^2}$ (1)

$= \sqrt{\frac{1}{2}} = \frac{\sqrt{2}}{2}$ (1)

$\frac{\sqrt{2}}{2}$

(Total for Question 1 is 6 marks)

2 The line with equation $2y = x + 1$ intersects the curve with equation $3y^2 + 7y + 16 = x^2 - x$ at the points A and B

Find the coordinates of A and the coordinates of B
Show clear algebraic working.

$3y^2 + 7y + 16 = (2y-1)^2 - (2y-1)$ 1

$3y^2 + 7y + 16 = 4y^2 - 4y + 1 - 2y + 1$

$3y^2 - 4y^2 + 7y + 6y + 16 - 2 = 0$

$-y^2 + 13y + 14 = 0$

$y^2 - 13y - 14 = 0$ 1

$(y-14)(y+1) = 0$ 1

$y = 14$, $y = -1$

$x = 2(14) - 1$, $x = 2(-1) - 1$
$= 27$ $= -3$ 1

$(27, 14)$ and $(-3, -1)$
1

(27 , 14) and (−3 , −1)

(Total for Question 2 is 5 marks)