Question	Scheme	Marks	AOs
1(a)	$\int \frac{1}{x^2+6x+25}\,\mathrm{d}x = \int \frac{1}{(x+3)^2-9+25}\,\mathrm{d}x = \int \frac{1}{(x+3)^2+16}\,\mathrm{d}x$ or reaches integral in θ if using substitution.	M1	3.1a
	$= k\arctan\left(\frac{x+b}{a}\right)(+c)$ (or $k\theta$ where $4\tan\theta = x+3$)	M1	1.1b
	$= \frac{1}{4}\arctan\left(\frac{x+3}{4}\right)+c$	A1	1.1b
		(3)	
(b)	$\int_{-3}^{1}\left(1-\frac{25}{x^2+6x+25}\right)\mathrm{d}x = \left[x-\frac{25}{4}\arctan\left(\frac{x+3}{4}\right)\right]_{-3}^{1} = (1-\ldots)-(-3-\ldots)$	M1	1.1b
	$= \left(1-\frac{25}{4}\arctan\left(\frac{4}{4}\right)\right)-\left(-3-\frac{25}{4}\arctan 0\right)$	A1ft	1.1b
	$= 4-\frac{25\pi}{16}$	A1	2.1
		(3)	
(c)	Since the graph crosses the x-axis at $x = 0$ the area lies partially below the x-axis, hence the expression does not give the total area as the part below the axis counts as negative which cancels the positive area, so the student is not correct.	B1	2.3
		(1)	
			(7 marks)

Notes:

(a)

M1: Identifies the need to and completes the square in the numerator to achieve a standard form, or selects the appropriate substitution $x + 3 = 4\tan\theta$. If using substitution, the integrand and $\mathrm{d}x$ must be dealt with and an integral in θ reached (or their chosen variable).

M1: Carries out the integration to a form $k\arctan\left(\frac{x+b}{a}\right)$

A1: Correct integral with or without c

(b)

M1: Applies limits to $x - 25\times$"their answer to (a)" and subtracts correct way.

A1ft: A correct unsimplified answer following through their answer to (a).

A1: Correct simplified exact answer.

(c)

B1: As scheme. Must refer to graph crossing the x-axis and signs of areas being different.