Question	Scheme	Marks
5(a)	$h = \frac{1}{4}$	B1
	$A \approx \left(\frac{1}{2}\times\frac{1}{4}\right)\left\{5.453+5+2\left(7.764+...+7.626\right)\right\}$	M1
	$A \approx \left(\frac{1}{2}\times\frac{1}{4}\right)\left\{5.453+5+2\left(7.764+9.375+9.964+9.367+7.626\right)\right\}$	A1
	= awrt 12.33	A1
		(4)
(b)	$\int x^{\frac{3}{2}} - 3x + 9\,\mathrm{d}x = kx^{\frac{5}{2}} - lx^2 + mx$ (at least two powers correct)	M1
	$\int x^{\frac{3}{2}} - 3x + 9\,\mathrm{d}x = \frac{2}{5}x^{\frac{5}{2}} - \frac{3}{2}x^2 + 9x\,(+c)$	A1A1
		(3)
(c)	$\left[\frac{2}{5}x^{\frac{5}{2}} - \frac{3}{2}x^2 + 9x\right]_{\frac{5}{2}}^{4} = \left(\frac{2}{5}\times 4^{\frac{5}{2}} - \frac{3}{2}\times 4^2 + 9\times 4\right) - \left(\frac{2}{5}\left(\frac{5}{2}\right)^{\frac{5}{2}} - \frac{3}{2}\left(\frac{5}{2}\right)^2 + 9\left(\frac{5}{2}\right)\right) = ...$ $\left(= 24.8 - 17.077... = 7.722...\right)$	M1
	Area R = "12.33" – "7.722" = …	M1
	= awrt 4.6	A1
		(3)
		(10 marks)

Notes:

(a)

B1: For using $h = 0.25$ or equivalent. Score for sight of $h = 0.25$ or $\frac{1}{2}\times\frac{1}{4}$ or just $\frac{1}{8}$ outside the brackets.

M1: Correct bracket structure for the trapezium rule. Look for "$h/2$"(first + last y values + 2(attempt at sum of remaining values)). If one value is missing, allow the M as a slip, but M0 if 1st or last value repeated. Must be y values used. Incorrect/invisible external bracketing may be recovered by implication.

A1: Correct bracket "$h/2$"{…} with all 7 y values used, though allow a minor miscopy of a term if it is clear the correct value is meant. May be implied by the correct answer.

A1: awrt 12.33

(b)

M1: Attempts to integrate. Power to increase by 1 in at least two terms.

A1: Any two terms correct.

A1: Fully correct. No need for constant of integration. Need not be simplified.

(c)

M1: Applies limits of 2.5 and 4 to their answer to (b) to get the area under C_2. Limits may be either way around for this mark. May be implied by awrt 7.72 and allow if scored from a calculator.

M1: Subtracts their area under C_2 from the answer to (a). Must be subtracting a positive number from "12.33", so if the limits were the wrong way round (or a negative answer was found in error), the answer must be made positive before subtracting.

A1: for awrt 4.6 following a correct answer to (a).

Question	Scheme	Marks
6(a)	Way 1: Eqn is $(x-3)^2+(y+4)^2-9-16+k=0$	M1
	So radius must be 4 $\Rightarrow 25-k=16$	M1
	$\Rightarrow k=9$	A1
		(3)
	Way 2: $y=0 \Rightarrow x^2-6x+k=0$ has one solution	M1
	$\Rightarrow 6^2-4\times1\times k=0$	M1
	$\Rightarrow k=9$	A1
		(3)
(b)	C intersects x axis at (3,0)	B1
	Intersects y axis when $y^2+8y+9=0 \Rightarrow y=...$ or $y="-4"\pm\sqrt{"16"-"9"}$ Or uses base of triangle is $2\sqrt{"16"-"9"}$	M1
	Area $RST=\frac{1}{2}\times2\sqrt{7}\times3$	M1
	$=3\sqrt{7}$	A1
		(4)
		(7 marks)

Notes:

(a) Way 1

M1: Attempts to complete square on both terms. May be implied by a centre of $(\pm3,\pm4)$

M1: Uses a valid method to find k, e.g. y coordinate of centre and sets $"9"+"16"-k=|\text{their “4”}|^2$. Can be implied by sight of $k=$ (their x coordinate of centre)^2

A1: Correct value for k

Way 2

M1: Substitutes equation for x axis ($y=0$) into the circle equation.

M1: Sets the discriminant of the resulting quadratic to 0 (since as a tangent there is only one point of intersection).

A1: Correct value for k

(b)

B1: Identifies or implies the coordinates where circle touches the x axis. Probably from having completed the square on the equation. The 0 ordinate need not be seen and may be seen anywhere.

M1: Attempts the y coordinates of the intersections with the y axis, or the distance between these two points. E.g. may set $x=0$ in the circle equation, or may use centre is 3 units from y axis etc.

M1: Uses a correct method for the area of the triangle RST. Longer methods are possible, such as use of cosine rule to find an angle in the triangle, followed by $\frac{1}{2}ab\sin C$, or may use the shoelace method, e.g. $\frac{1}{2}\begin{vmatrix}3 & 0 & 0\\ 0 & -4+\sqrt{7} & -4-\sqrt{7}\end{vmatrix}=\frac{1}{2}\left|3\left(-4+\sqrt{7}\right)+0+0-0-0-3\left(-4-\sqrt{7}\right)\right|$

A1: Correct answer.