Question	Scheme	Marks	AOs
10(a)	$8(4)-4^{\frac{5}{2}}=32-32=0$	B1	1.1b
		(1)	
(b)	$8-\frac{5}{2}x^{\frac{3}{2}}$	B1	1.1b
	$x=4\Rightarrow\left\{\frac{\mathrm{d}y}{\mathrm{d}x}=\right\}8-\frac{5}{2}\times8=-12$ $\Rightarrow y\{-0\}="-12"(x-4)$	M1	1.1b
	$12x+y=48$ *	A1*	1.1b
		(3)	
(c)	Attempts to find one of the coordinates of the point of intersection $y=8x,\ 12x+y=48\Rightarrow y=19.2$ (or x = 2.4)	M1	1.1b
	Triangle area is $\frac{1}{2}\times4\times"19.2"\left(=38.4\text{ or }\frac{192}{5}\right)$ or $\int_0^{"2.4"}8x\ \mathrm{d}x+\int_{"2.4"}^{4}"(48-12x)"\ \mathrm{d}x$	dM1	3.1a
	$\int\left(8x-x^{\frac{5}{2}}\right)\mathrm{d}x=4x^2-\frac{2}{7}x^{\frac{7}{2}}$	B1	1.1b
	$A=38.4-\left["4x^2-\frac{2}{7}x^{\frac{7}{2}}"\right]_0^4=38.4-64+\frac{256}{7}$	ddM1	3.1a
	$=\frac{384}{35}$	A1	1.1b
		(5)	
			(9 marks)

Notes

(a)

B1: Substitutes x = 4 into the equation of the curve and verifies that y = 0. Accept "$8(4)-4^{\frac{5}{2}}=0$"

Alternatively, sets $8x-x^{\frac{5}{2}}=0$ and solves with correct processing to achieve x = 4.

As a minimum accept e.g. $8x-x^{\frac{5}{2}}=0\ \Rightarrow\ x^{\frac{3}{2}}=8\ \Rightarrow\ \{x=\}\ 4$ which may follow factorisation.

(b)

B1: Correct differentiation. The $\frac{\mathrm{d}y}{\mathrm{d}x}=$ need not be present.

M1: Correct method for finding the equation of the tangent at $A(4, 0)$.

Requires substitution of x = 4 into their $\frac{\mathrm{d}y}{\mathrm{d}x}$ and an attempt at the equation of the line using this gradient. If using $y-y_1=m(x-x_1)$ then condone the omission of the – 0.

If $y=mx+c$ is used they must proceed as far as $c=\ldots$

Accept $\frac{\mathrm{d}y}{\mathrm{d}x}=-12$ or m = –12 without explicit substitution of x = 4 provided $8-\frac{5}{2}x^{\frac{3}{2}}$ is seen.

A1*: Correct work leading to the given equation having scored B1M1.
Condone $y+12x=48$ and apply isw once seen.
Do not condone $12x+y-48=0$ (unless a correct equation = 48 is seen).

(c) **Note:** Condone poor notation such as missing dx or spurious $\int$ symbols throughout.

M1: Attempts to find either the x or y coordinate of the intersection of line l_1 and line l_2
You may need to check the diagram or limits to their integrals.

dM1: Correct method for the area of the triangle. e.g. Triangle area is $\frac{1}{2}\times 4\times "19.2"\left(=38.4 \text{ or } \frac{192}{5}\right)$

If integration is attempted then condone slips in their rearrangement of $12x+y=48$ to $y=48-12x$ and note that their integrals do need not to be evaluated, so for example

look for $\int_0^{"2.4"} 8x \, dx + \int_{"2.4"}^{4} "(48-12x)" \, dx$ $\left\{=\frac{576}{25}+\frac{384}{25}=23.04+15.36\right\}$

B1: Correct integration of **curve** ignoring limits, i.e. $4x^2-\frac{2}{7}x^{\frac{7}{2}}$ but condone e.g. $\frac{8x^{1+1}}{2}-\frac{x^{\frac{5}{2}+1}}{\frac{7}{2}}$

ddM1: Fully correct strategy including substitution which would lead to an **exact** area.
Does not need to reach a value. Dependent on both previous M marks.
Implied by $38.4-\frac{192}{7}$ or a correct final answer $\frac{384}{35}$
Note that the decimal approximation that might be seen is 10.97142857 and implies ddM0 unless there is evidence of substitution (which need not be evaluated).

A1: Correct exact value. Either $\frac{384}{35}$ or $10\frac{34}{35}$

Alternative using lines – curve:

M1: Attempts to find either the x or y coordinate of the intersection of line l_1 and line l_2
You may need to check the diagram or limits to their integrals.

dM1: Correct method for at least one part (0 to "2.4" **or** "2.4" to 4) of the area of R including limits.
Condone slips in their rearrangement of $12x+y=48$ to $y=48-12x$ and note that their integrals do need not to be evaluated, so for example

look for $\int_0^{"2.4"} 8x-\left(8x-x^{\frac{5}{2}}\right)dx$ or $\int_{"2.4"}^{4} "(48-12x)"-\left(8x-x^{\frac{5}{2}}\right) dx$ (or a sum of both)

B1: Correct integration of **both** regions ignoring limits. May be completed as a sum or separately.

Condone e.g. $\frac{x^{\frac{5}{2}+1}}{\frac{7}{2}}$ in place of $\frac{2}{7}x^{\frac{7}{2}}$ Note that each integral may have been simplified.

$$\int_{...}^{...} x^{\frac{5}{2}} \, dx \text{ and } \{+\} \int_{...}^{...} 48-20x+x^{\frac{5}{2}} \, dx \rightarrow \left[\frac{2}{7}x^{\frac{7}{2}}\right]_{...}^{...} \text{ and } \{+\} \left[48x-10x^2+\frac{2}{7}x^{\frac{7}{2}}\right]_{...}^{...}$$

ddM1: Fully correct strategy including substitution which would lead to an **exact** area.
Does not need to reach a value. Dependent on both previous M marks.
This approach requires:

- substitution of 0, their 2.4 and 4 in the correct places
- the $\frac{2}{7}(2.4)^{\frac{7}{2}}-\frac{2}{7}(2.4)^{\frac{7}{2}}$ to be cancelled (may be implied by a correct final answer $\frac{384}{35}$)

Note that the decimal approximation that might be seen is 10.97142857 and implies ddM0 unless there is evidence that the $\frac{2}{7}(2.4)^{\frac{7}{2}}-\frac{2}{7}(2.4)^{\frac{7}{2}}$ has been cancelled e.g. ~~6.118...~~ – ~~6.118...~~

A1:	Correct exact value. Either $\frac{384}{35}$ or $10\frac{34}{35}$