Question Number	Scheme	Marks
1	Assume that there exists a number m such that when m^3 is even, m is odd	B1
	If m is odd then $m=2p+1$ (where p is an integer) and $m^3=(2p+1)^3=...$	M1
	$=8p^3+12p^2+6p+1$	A1
	$2\times(4p^3+6p^2+3p)+1$ is odd and hence we have a contradiction so if n^3 is even, then n is even.	A1
		(4) **(4 marks)**

B1: For setting up the contradiction.

Eg Assume that there exists a number m such that when m^3 is even, m is odd

Condone a contra-positive statement here

"Assume that there exists a number m such that when m^3 is even, m is not even"

As a minimum accept "assume if m^3 is even then m is odd."

Condone the other way around " assume if n is odd then n^3 is even"

M1: Attempts to cube an odd number. Accept an attempt at $(2p+1)^3$, $(2p-1)^3$

Look for $(2p+1)^3=...p^3.....$

A1: $(2p+1)^3=8p^3+12p^2+6p+1$ or simplified equivalent such as $2\times(4p^3+6p^2+3p)+1$.

For $(2p-1)^3=8p^3-12p^2+6p-1$ or equivalent such as $2\times(4p^3-6p^2+3p-1)+1$

A1: For a fully correct proof. Requires correct calculations with reason and conclusion

E.g. 1 Correct calculations $(2p+1)^3=8p^3+12p^2+6p+1=$

Reason (even +1) = odd

Conclusion "hence we have a contradiction, so if n^3 is even, then n is even."

E.g. 2 Correct calculations $(2p+1)^3=8p^3+12p^2+6p+1$

Reason $=2\times(4p^3+6p^2+3p)+1$ = odd

Conclusion "this is contradiction, so proven."

E.g. 3 Correct calculations $(2p-1)^3=8p^3-12p^2+6p-1$

Reason = $8p^3-12p^2+6p$ is even so $8p^3-12p^2+6p-1$ is odd

Conclusion: So if n^3 is even then n must be even

Note that B0 M1 A1 A1 is possible

Question Number	Scheme	Marks
2(a)	$4^{-\frac{1}{2}}$ or $\frac{1}{4^{\frac{1}{2}}}$ or $\frac{1}{2}$	B1
	$(4-5x)^{-\frac{1}{2}} = \frac{1}{2}\left(1-\frac{5x}{4}\right)^{-\frac{1}{2}}$ $= \ldots\left(1+\left(-\frac{1}{2}\right)\times\left(-\frac{5x}{4}\right)+\frac{\left(-\frac{1}{2}\right)\times\left(-\frac{3}{2}\right)}{2!}\times\left(-\frac{5x}{4}\right)^2+\ldots\right)$	M1A1
	$= \frac{1}{2}+\frac{5}{16}x+\frac{75}{256}x^2+\ldots$	A1
		(4)
	$\frac{2+kx}{(2-3x)^3} = (2+kx)\left(\frac{1}{2}+\frac{5}{16}x+\frac{75}{256}x^2+\ldots\right)$	
(b)	Compares x terms leading to k = ... E.g. $\frac{10}{16}+\frac{k}{2}=\frac{3}{10} \Rightarrow k=-\frac{13}{20}$	M1 A1
		(2)
(c)	Compares x^2 terms leading to m = ... E.g. $m=\frac{75}{128}+\frac{5}{16}\times'-\frac{13}{20}' \Rightarrow m=\frac{49}{128}$	M1 A1
		(2)
		(8 marks)
Alt (a)	$4^{-\frac{1}{2}}$ or $\frac{1}{4^{\frac{1}{2}}}$	B1
	$(4-5x)^{-\frac{1}{2}} = 4^{-\frac{1}{2}}+\left(-\frac{1}{2}\right)4^{-\frac{3}{2}}(-5x)+\frac{-\frac{1}{2}\times-\frac{3}{2}}{2}4^{-\frac{5}{2}}(-5x)^2$	M1A1
	$= \frac{1}{2}+\frac{5}{16}x+\frac{75}{256}x^2+\ldots$	A1
		(4)

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