Question	Scheme	Marks	AOs
16	Attempts to find n^3+3n^2-2n for either odds **or** evens e.g. $n=2k \quad (2k)^3+3(2k)^2-2(2k)=...$ **or** e.g. $n=2k+1 \quad (2k+1)^3+3(2k+1)^2-2(2k+1)=...$	M1	2.1
	e.g. $8k^3+12k^2-4k=2(4k^3+6k^2-2k)$ which is even **or** e.g. $8k^3+24k^2+14k+2=2(4k^3+12k^2+7k+1)$ which is even	A1	2.2a
	Attempts to find n^3+3n^2-2n for odds **and** evens e.g. $n=2k \quad (2k)^3+3(2k)^2-2(2k)=...$ **and** e.g. $n=2k+1 \quad (2k+1)^3+3(2k+1)^2-2(2k+1)=...$	dM1	3.1a
	e.g. $8k^3+12k^2-4k=2(4k^3+6k^2-2k)$ **and** e.g. $8k^3+24k^2+14k+2=2(4k^3+12k^2+7k+1)$ **hence even for all positive integers *n*** *	A1*	2.4
		(4)	

(4 marks)

Notes

There should be no errors in the algebra but allow e.g. invisible brackets to be "recovered". Condone the use of e.g. $n=2n$ **or** $n=2n+1$ for the first three marks.

M1: Uses algebra to describe odds e.g. $n=2k$ or evens e.g. $n=2k+1$ and attempts n^3+3n^2-2n (allow equivalent representation of odd or even e.g. $n=2k-1$ **or** $n=2k+2$). They must attempt to expand the brackets to achieve a cubic expression but condone arithmetical slips.

Note they may factorise the cubic first $n^3+3n^2-2n=n(n^2+3n-2)$ before attempting to describe odds or evens. With this approach it is sufficient for the even case to just say that as *n* is even then the expression will be even.

A1: They must achieve a correct expanded cubic expression (which may be factorised) for either odds or evens and shows or gives an explanation as to why the expression is even.

e.g. $8k^3+12k^2-4k=2(4k^3+6k^2-2k)$ which is even

e.g. $8k^3+12k^2-4k$ which is even as 2 is a factor of each term

but allow the even case of e.g. $n^3+3n^2-2n=n(n^2+3n-2)$ which is even if *n* is even

dM1: Uses algebra to describe odds e.g. $n=2k$ and evens e.g. $n=2k+1$ and attempts n^3+3n^2-2n (allow equivalent representation of odd or even e.g. $n=2k-1$ **and** $n=2k+2$). They must attempt to expand the brackets to achieve a cubic expression but condone arithmetical slips.

Note they may factorise the cubic first $n^3+3n^2-2n=n(n^2+3n-2)$ before attempting to describe odds or evens. With this approach it is sufficient for the even case to just say that as *n* is even then the expression will be even.

A1*:	Fully correct proof. They must achieve a correct expanded $n^3 + 3n^2 - 2n$ for both odds and evens and shows or gives reasons/explanations as to why the expressions are even. There must be an overall conclusion as well e.g. hence even for all positive integers Withhold this mark for use of e.g. $n = 2n$ **or** $n = 2n + 1$