1. A student is investigating the following statement about natural numbers.	
" $n^3 - n$ is a multiple of 4"	
(a) Prove, using algebra, that the statement is true for all odd numbers.	(4)
	(4)
(b) Use a counterexample to show that the statement is not always true.	(1)

	2. ((i)	A	student	states
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"if x^2 is greater than 9 then x must be greater than 3"

Determine whether or not this statement is true, giving a reason for your answer.

(1)

(ii) Prove that for all positive int	tegers n,	
	$n^3 + 3n^2 + 2n$	
is divisible by 6		(3)

3.	In this question p and q are positive integers with $q > p$					
	Statement 1: $q^3 - p^3$ is never a multiple of 5					
	(a) Show, by means of a counter example, that Statement 1 is not true. Statement 2: When p and q are consecutive even integers $q^3 - p^3$ is a multiple of 8					
	(b) Prove, using algebra, that Statement 2 is true.	(4)				

l. (i) Use proof by exhaustion to show that for $n \in \mathbb{N}$, $n \le 4$	
$(n+1)^3 > 3^n$	
	(2)
(ii) Given that $m^3 + 5$ is odd, use proof by contradiction to show, using algebra, that m is even.	
	(4)

5. Prove, using algebra, that	
$(n+1)^3 - n^3$	
is odd for all $n \in \mathbb{N}$	
	(4)