18/ $-5n^2+9n+7$ is odd for any $n \in \mathbb{N}$

n is even : $n = 2k$

$$-5n^2+9n+7 = -5\times(2k)^2 + 9\times(2k)+7$$
$$= -20k^2+18k+7$$
$$= 2\times(-10k^2+9k)+7$$

n is odd : $n = 2k+1$,

$$-5n^2+9n+7 = -5\times(2k+1)^2 + 9\times(2k+1)+7$$
$$= -5\times(4k^2+4k+1)+18k+9+7$$
$$= -20k^2-20k-5+18k+16$$
$$= -20k^2-2k+11$$
$$= 2\times(-10k^2-k)+11$$

Sum of even and odd is odd.

19/ $-5n^2-n+2$ is even for any $n \in \mathbb{N}$

n is odd : $n = 2k+1$

$$-5n^2-n+2 = -5\times(2k+1)^2 - (2k+1)+2$$
$$= -5\times(4k^2+4k+1)-2k-1+2.$$
$$= -20k^2-20k-5-2k+1.$$
$$= -20k^2-22k-4$$
$$= 2\times(-10k^2-11k-2).$$

n is even : $n = 2k$

$$-5n^2-n+2 = -5\times(2k)^2-(2k)+2$$
$$= -20k^2-2k-2.$$
$$= 2\times(-10k^2-k+1)$$

Which is even

Date

20. Show that $n^2 - 5n - 10$ is even for any $n \in \mathbb{N}$

n is even : $n = 2k$

$$n^2 - 5n - 10 = (2k)^2 - 5 \times (2k) - 10$$
$$= 4k^2 - 10k - 10$$
$$= 2 \times (2k^2 - 5k - 5)$$

n is odd : $n = 2k + 1$

$$n^2 - 5n - 10 = (2k+1)^2 - 5 \times (2k+1) - 10$$
$$= (4k^2 + 4k + 1) - 10k - 5 - 10$$
$$= 4k^2 + 4k + 1 - 10k - 15$$
$$= 4k^2 - 6k - 14$$
$$= 2 \times (2k^2 - 3k - 7)$$

$\therefore$ Which is even.