6. (a) Use the standard results for $\sum_{r=1}^{n} r^2$ and $\sum_{r=1}^{n} r$ to show that

$$\sum_{r=1}^{n} (3r - 2)^2 = \frac{1}{2} n \left[6n^2 - 3n - 1 \right]$$

for all positive integers n.

(5)

(b) Hence find any values of n for which

$$\sum_{r=5}^{n} (3r - 2)^2 + 103 \sum_{r=1}^{28} r \cos \left(\frac{r\pi}{2} \right) = 3n^3$$

(5)