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

$$\sum_{r=1}^{n} r(r+1) = \frac{n}{3}(n+a)(n+b)$$

where a and b are integers to be determined.

(4)

(b) Hence show that

$$\log 9 + 2\log 27 + 3\log 81 + \ldots + 11\log(531\,441)$$

can be written in the form $p\log q$, where p and q are integers to be determined.

(4)