Exercise 8

In the following exercises, use summation properties and formulas to rewrite and evaluate the sums.

$$\sum_{k=1}^{20} 100\left(k^2 - 5k + 1\right)$$

Solution

$$\begin{aligned}
\sum_{k=1}^{20} 100\left(k^2 - 5k + 1\right) &= 100\sum_{k=1}^{20}\left(k^2 - 5k + 1\right) \\
&= 100\left(\sum_{k=1}^{20} k^2 - \sum_{k=1}^{20} 5k + \sum_{k=1}^{20} 1\right) \\
&= 100\left(\sum_{k=1}^{20} k^2 - 5\sum_{k=1}^{20} k + \sum_{k=1}^{20} 1\right) \\
&= 100\left[\frac{20(20+1)(40+1)}{6} - 5\frac{20(20+1)}{2} + 20(1)\right] \\
&= 100\left[2870 - 5(210) + 20\right] \\
&= 100(1840) \\
&= 184\,000
\end{aligned}$$