

Suppose we want to find a closed form for the sum

$$\sum_{n=5}^{64} c^n.$$

An antiderivative of c^n is $\frac{1}{c-1}c^n$. Therefore, by the fundamental theorem of finite difference, we have

$$\sum_{n=5}^{64} c^n = \frac{1}{c-1} c^n \bigg|_5^{65} = \frac{c^{65} - c^5}{c-1}$$