Induction – Q8 [Practice/E] (18/6/23)

$\sum_{r=1}^{n} 2^r = 2(2^n - 1)$

Solution

[Show that the result is true for $n = 1$]

Now assume that the result is true for $n = k$, so that

$\sum_{r=1}^{k} 2^r = 2(2^k - 1)$

Then $\sum_{r=1}^{k+1} 2^r = 2(2^k - 1) + 2^{k+1}$

$= 2^{k+1}(1 + 1) - 2 = 2(2^{k+1} - 1)$

[Standard wording]