

## Analysis 1 - Practice open questions

Suggested time is 30 minutes.

1. Show by induction that for all  $n \geq 1$ ,

$$\sum_{k=1}^n \frac{2^k(k-1)}{(k+1)!} = 2 - \frac{2^{n+1}}{(n+1)!}.$$

2. Let  $I$  be some open interval and  $f : I \rightarrow \mathbb{R}$  be a function that is continuous at  $x_0 \in I$ . Prove that if  $f(x_0) > 0$  then  $f(x) > 0$  on some open interval containing  $x_0$ .