#9. $S = \sum_{n=2}^{\infty} \frac{2^n}{n!} x^n$.

Sol To determine interval of convergence, we use the ratio test:

The series S is absolutely convergent if

$$1 > \lim_{n\to\infty} \left| \frac{2^{n+1}}{(n+1)!} x^{n+1} \Big/ \frac{2^n}{n!} x^n \right| = \lim_{n\to\infty} \left| \frac{2^{n+1}}{(n+1)!} \cdot \frac{n!}{2^n} \right| |x|$$

$$= \lim_{n\to\infty} \left| \frac{2}{n+1} \right| |x| = 0.$$

Therefore for all $x \in \mathbb{R}$, the given series is convergent

i.e. $-\infty < x < \infty$ is the interval of convergence. $\square$

See also: p. 674 Example 2
p. 672 Example 1(b)
p. 679 #11, #12, #16, #20 #25 #26