Determine if the following series converge and explain “‘why”:

(a) $$\sum_{n\geq 1} \frac{1}{\sqrt{n(n+1)}}$$

(b) $$\sum_{n\geq 1} \frac{(n!)^2}{(2n)!}$$

(c) $$\sum_{n\geq 1} \frac{n!}{n^n}$$

(d) $$\sum_{n\geq 1} \frac{(n!)^2}{2^{n^2}}$$

(e) $$\frac{1000}{1} + \frac{1000 \cdot 1001}{1 \cdot 3} + \frac{1000 \cdot 1001 \cdot 1002}{1 \cdot 3 \cdot 5} + \cdots$$

(f) $$\sum_{n\geq 1} (2^{1/2} - 2^{1/3})(2^{1/2} - 2^{1/5}) \cdots (2^{1/2} - 2^{1/(2n+1)})$$

(g) $$\sum_{n\geq 1} \frac{n^2}{(2+\frac{1}{n})^n}$$

(h) $$\sum_{n\geq 1} \frac{n^{n+\frac{1}{n}}}{(n+\frac{1}{n})^n}$$

(i) $$\sum_{n=1}^{\infty} a_n \quad \text{where } a_n := \begin{cases} 1/n & \text{if } n = m^2 \\ 1/n^2 & \text{if } n \neq m^2. \end{cases}$$

(j)

$$\sqrt{2} + \sqrt{2-\sqrt{2}} + \sqrt{2-\sqrt{2+\sqrt{2}}} + \sqrt{2-\sqrt{2+\sqrt{2+\sqrt{2}}}} + \cdots$$