Determine whether the series is absolutely convergent, conditionally convergent or divergent.

1) $\sum_{n=1}^{\infty} \frac{n^2}{2^n}$ $\boxed{\text{Absolutley Convergent}}$

2) $\sum_{n=0}^{\infty} \frac{(-10)^n}{n!}$ $\boxed{\text{Absolutley Convergent}}$

3) $\sum_{n=1}^{\infty} (-1)^{n-1} \frac{2^n}{n^4}$ $\boxed{\text{Divergent}}$

4) $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{\sqrt[4]{n}}$ $\boxed{\text{Conditionally Convergent}}$

5) $\sum_{n=1}^{\infty} (-1)^n \frac{n}{5+n}$ **Divergent**

6) $\sum_{n=1}^{\infty} (-1)^{n-1} \frac{n}{n^2+1}$ **Conditionally Convergent**

7) $\sum_{n=1}^{\infty} \frac{1}{(2n)!}$ **Absolutley Convergent**

8) $\sum_{n=1}^{\infty} e^{-n} n!$ **Divergent**

9) $\displaystyle\sum_{n=1}^{\infty} \frac{\sin 4n}{4^n}$ $\boxed{\text{Absolutley Convergent}}$

10) $\displaystyle\sum_{n=1}^{\infty} (-1)^{n+1} \frac{n^2 2^n}{n!}$ $\boxed{\text{Absolutley Convergent}}$

11) $\displaystyle\sum_{n=1}^{\infty} \frac{10^n}{4^{2n+1}(n+1)}$ $\boxed{\text{Absolutley Convergent}}$

12) $\displaystyle\sum_{n=2}^{\infty} \frac{(-1)^n}{\ln n}$ $\boxed{\text{Conditionally Convergent}}$

13) $\sum_{n=1}^{\infty} \frac{n!}{n^n}$ Absolutley Convergent

14) $\sum_{n=1}^{\infty} \frac{\cos(n\pi/3)}{n!}$ Absolutley Convergent

15) $\sum_{n=2}^{\infty} \frac{(-1)^n}{(\ln n)^n}$ Absolutley Convergent

16) $\sum_{n=1}^{\infty} \frac{n^n}{3^{3n+1}}$ Divergent

17) $\sum_{n=2}^{\infty} \frac{(-1)^n}{n \ln n}$ $\boxed{\text{Conditionally Convergent}}$

18) $\sum_{n=1}^{\infty} \frac{(-1)^n}{(\arctan n)^n}$ $\boxed{\text{Absolutley Convergent}}$

19) $1 - \frac{1 \cdot 3}{3!} + \frac{1 \cdot 3 \cdot 5}{5!} - \frac{1 \cdot 3 \cdot 5 \cdot 7}{7!} + \cdots + (-1)^{n-1} \frac{1 \cdot 3 \cdot 5 \cdot \cdots \cdot (2n-1)}{(2n-1)!} + \cdots$ $\boxed{\text{Absolutley Convergent}}$

20) $\sum_{n=1}^{\infty} \frac{2 \cdot 4 \cdot 6 \cdot \cdots \cdot (2n)}{n!}$ $\boxed{\text{Divergent}}$

21) The terms of a series is defined recursively by the equations:

$$a_1 = 2 \qquad a_{n+1} = \frac{5n+1}{4n+3} a_n$$

Determine whether $\sum a_n$ converges or diverges.

$\boxed{\text{Divergent}}$

22) For which positive integers k is the following series convergent?

$$\sum_{n=1}^{\infty} \frac{(n!)^2}{(kn)!}$$

$\boxed{k \geq 2}$