1) $\left\{ \frac{1}{n} \right\}_{n=1}^{+\infty}$

$$\frac{1}{n+1} - \frac{1}{n} = \frac{n}{n(n+1)} - \frac{n+1}{n(n+1)} = \frac{\cancel{n} - \cancel{n} - 1}{n(n+1)} =$$

Let $n=1$

$-\frac{1}{2}$ strictly decreasing

3) $\left\{ \frac{n}{2n+1} \right\}_{n=1}^{+\infty}$

$$\frac{n+1}{2(n+1)+1} - \frac{n}{2n+1} = \frac{n+1}{2n+3} - \frac{n}{2n+1} > 0$$

Strictly Increasing

5) $\left\{ n - 2^n \right\}_{n=1}^{+\infty}$

$$\left((n+1) - 2^{(n+1)}\right) - \left(n - 2^n\right) = \cancel{N} + 1 - 2^{(n+1)} - \cancel{N} + 2^N = -\left(-1 + 2^{(n+1)} - 2^N\right)$$

Let $n=1$ $\quad -1$

strictly decreasing

7) $\left\{ \frac{n}{2n+1} \right\}_{n=1}^{+\infty}$

$$\frac{\frac{n+1}{2(n+1)+1}}{\frac{n}{2n+1}} = \frac{n+1}{2(n+1)+1} \cdot \frac{2n+1}{n} = \frac{(2n+1)(n+1)}{N(2(N+1)+1)}$$

Let $n=1$

$\frac{3(2)}{5} = \frac{6}{5}$ Strictly Increasing

9) $\left\{ ne^{-n} \right\}_{n=1}^{+\infty}$

$$\frac{(n+1)e^{-(n+1)}}{ne^{-n}} = \frac{\frac{N+1}{e^{N+1}}}{\frac{N}{e^N}} = \frac{N+1}{e^{N+1}} \cdot \frac{e^N}{N} = \frac{e^N(N+1)}{N \cdot e^{N+1}}$$

Let $n=1$

$\frac{e^1(2)}{e^2} = 0.73$

Strictly decreasing

11) $\left\{ \frac{n^n}{n!} \right\}_{n=1}^{+\infty}$

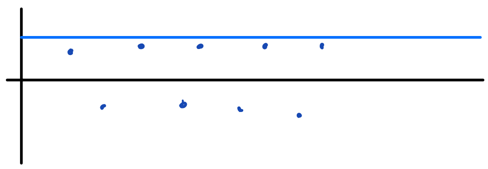
$$\frac{\frac{(n+1)^{n+1}}{(n+1)!}}{\frac{n^n}{n!}} = \frac{(n+1)^{n+1}}{(n+1)!} \cdot \frac{n!}{n^n} = \frac{(N+1)^n \cdot N+1 \cdot N!}{N^N (n+1)!}$$

Let $n=1$

$\frac{2 \cdot 2 \cdot 1}{2} = 2$ Strictly increasing

13) True, since the difference of $a_{n+1} - a_n > 0$, the sequence $\{a_n\}$ is increasing because the second term (a_{n+1}) is larger than a_n therefore $\{a_n\}$ will follow the trend and continue to increase

15) False,



if a function is bounded, but oscillating, it will still diverge

17) $\left\{ \dfrac{n}{2n+1} \right\}_{n=1}^{+\infty}$ let $f(x) = \dfrac{x}{2x+1}$

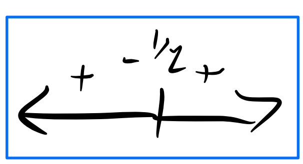
$$f'(x) = x(2x+1)^{-1}$$

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

$$= -\frac{2x}{(2x+1)^2} + \frac{1}{2x+1}$$

$$= -\frac{\cancel{2x}}{(2x+1)^2} + \frac{\cancel{2x}+1}{(2x+1)^2}$$ Strictly Increasing

$$= \frac{1}{(2x+1)^2}$$



19) $\{\tan^{-1} n\}_{n=1}^{+\infty}$ let $f(x)=\tan^{-1}(x)$

$f'(x) = \dfrac{1}{1+x^2}$ $\quad +$ $\quad \boxed{\text{Strictly Inc.}}$

21) $\{2n^2-7n\}_{n=1}^{+\infty}$ Let $f(x)=2x^2-7x$

$f'(x)=4x-7$ $\quad -\ [7/4\ \ +)$ $\quad \boxed{\text{Strictly Inc } x > 7/4}$

23) $\left\{\dfrac{n!}{3^n}\right\}_{n=1}^{+\infty}$ $\qquad \dfrac{(n+1)!}{3^{n+1}}\cdot\dfrac{3^n}{n!}$

$a_n = \dfrac{n!}{3n}$ $\quad a_{n+1} = \dfrac{(n+1)!}{3(n+1)}$

$$= \frac{(n+1)\cancel{n!}}{\cancel{3^n}\cdot 3}\cdot\frac{\cancel{3^n}}{\cancel{n!}} = \frac{n+1}{3}$$

For $x > 2$ strictly increasing