1) Let $a_n = \dfrac{2n}{3n+1}$.

    a) Determine whether a_n is convergent. $\boxed{\text{Converges}}$

    b) Determine whether $\displaystyle\sum_{n=1}^{\infty} a_n$ is convergent. $\boxed{\text{Diverges}}$

Determine whether the series is convergent or divergent. If it is convergent, find its sum.

2) $3 + 2 + \dfrac{4}{3} + \dfrac{8}{9} + \ldots$ $\boxed{\text{Converges, } 9}$

3) $\displaystyle\sum_{n=1}^{\infty} 5\left(\dfrac{2}{3}\right)^{n-1}$ $\boxed{\text{Converges, } 15}$

4) $\displaystyle\sum_{n=1}^{\infty} \dfrac{(-6)^{n-1}}{5^{n-1}}$ $\boxed{\text{Diverges}}$

5) $\displaystyle\sum_{n=1}^{\infty} \frac{e^n}{3^{n-1}}$ $\boxed{\text{Converges, } \dfrac{3e}{3-e}}$

6) $\displaystyle\sum_{n=1}^{\infty} \frac{n}{n+5}$ $\boxed{\text{Diverges}}$

7) $\displaystyle\sum_{n=1}^{\infty} \frac{3}{n}$ $\boxed{\text{Diverges}}$

8) $\displaystyle\sum_{n=2}^{\infty} \frac{2}{n^2-1}$ $\boxed{\text{Converges, } \dfrac{3}{2}}$

9) $\displaystyle\sum_{n=1}^{\infty} \frac{(n+1)^2}{n(n+2)}$ $\boxed{\text{Diverges}}$

10) $\displaystyle\sum_{n=1}^{\infty} \frac{2}{n^2+4n+3}$ $\boxed{\text{Converges, } \dfrac{5}{6}}$

11) $\displaystyle\sum_{n=1}^{\infty} \frac{3^n+2^n}{6^n}$ $\boxed{\text{Converges, } \dfrac{3}{2}}$

12) $\displaystyle\sum_{n=1}^{\infty} \arctan(n)$ $\boxed{\text{Diverges}}$

13) $\displaystyle\sum_{n=1}^{\infty}(\cos 1)^n$ $\boxed{\text{Converges, } \dfrac{\cos(1)}{1-\cos(1)}}$

14) $\displaystyle\sum_{n=1}^{\infty}\left(\dfrac{3}{n(n+3)}+\dfrac{5}{4^n}\right)$ $\boxed{\text{Converges, } \dfrac{5}{3}}$

Express the number as a ratio of integers.

15) $0.\overline{2}$ $\boxed{\dfrac{2}{9}}$

16) $0.\overline{73}$ $\boxed{\dfrac{73}{99}}$

17) $6.2\overline{54}$ $\boxed{\dfrac{344}{55}}$

18) $0.123\overline{456}$ $\boxed{\dfrac{41,111}{333,000}}$

Find the values of x for which the series converges. Find the sum of the series for those values of x.

19) $\displaystyle\sum_{n=1}^{\infty} \frac{x^n}{3^n}$ $\boxed{-3 < x < 3, \quad \dfrac{x}{3-x}}$

20) $\displaystyle\sum_{n=1}^{\infty} (x-4)^n$ $\boxed{3 < x < 5, \quad \dfrac{x-4}{5-x}}$

21) $\displaystyle\sum_{n=0}^{\infty} 4^n x^n$ $\boxed{|x| < \dfrac{1}{4}, \quad \dfrac{1}{1-4x}}$

22) $\displaystyle\sum_{n=0}^{\infty} \dfrac{\cos^n x}{2^n}$ $\boxed{\text{all real values of } x, \quad \dfrac{2}{2-\cos x}}$

23) If the nth partial sum of a series $\displaystyle\sum_{n=1}^{\infty} a_n$ is $s_n = \dfrac{n-1}{n+1}$ find a_n and $\displaystyle\sum_{n=1}^{\infty} a_n$. $\boxed{a_n = \dfrac{2}{n(n+1)}, \quad \displaystyle\sum_{n=1}^{\infty} a_n = 1}$

24) What is the value of c if $\displaystyle\sum_{n=2}^{\infty}(1+c)^{-n} = 2$? $\boxed{c = \dfrac{\sqrt{3}-1}{2}}$