FICHA 1: LÍMITES DE SUCESIONES PARTEI

1.- $\lim_{n\to\infty}\frac{6n^2+4n-6}{3n^2-6n+7} = \frac{6}{3} = 2$; mismo grado

2.- $\lim_{n\to\infty}\frac{\sqrt{n^2+5n-1}}{\sqrt{2n^3+3n^2+2}} = \left[\frac{(\text{grado } 1)}{(\text{grado } 3/2)}\right] = 0$

3.- $\lim_{n\to\infty}\left(\frac{2n+6}{3n-5}\right)^n = \left(\frac{2}{3}\right)^\infty = 0$

4.- $\lim_{n\to\infty}\left(\sqrt{\frac{8n^2-2n}{2n^2-3}}\cdot\sqrt{\frac{(n+1)^2}{n^2-3n+5}}\right) = \sqrt{4}\cdot\sqrt{1} = 2$

5.- $\lim_{n\to\infty}\left[(2n+4)^{-1}\cdot\sqrt{n^2-3}\right] = \lim_{n\to\infty}\frac{\sqrt{n^2-3}}{2n+4} = \frac{1}{2}$

6.- $\lim_{n\to\infty}\left(\frac{n^2+2}{n+1}-\frac{3n-1}{3}\right) = [\infty-\infty] = \lim_{n\to\infty}\frac{3n^2+6-(3n-1)(n+1)}{3(n+1)} = \lim_{n\to\infty}\frac{-3n+n+7}{3n+3}$

$= -1$

7.- $\lim_{n\to\infty}\left(\sqrt{n^2}-\sqrt{n^2+n}\right) = \lim_{n\to\infty}\frac{(\sqrt{n^2}-\sqrt{n^2+n})(\sqrt{n^2}+\sqrt{n^2+n})}{(\sqrt{n^2}+\sqrt{n^2+n})} = \lim_{n\to\infty}\frac{-n}{\sqrt{n^2}+\sqrt{n^2+n}}$

$= -1/2$

8.- $\lim_{n\to\infty}\left[n\cdot(n+1)-\frac{1}{(\sqrt{n})^{-1}}\right] = \lim_{n\to\infty}\left[n^2+n-\sqrt{n}\right] = \infty$

9.-

10.- $\lim_{n\to\infty}\left(\frac{n^2-3n+1}{n^2+n-1}\right)^{2n} = (1^\infty) = \lim_{n\to\infty}\left(1+\frac{n^2-3n+1-n^2-n+1}{n^2+n-1}\right)^{2n} =$

$= \lim_{n\to\infty}\left(1+\frac{-4n+2}{n^2+n-1}\right)^{2n} = \lim_{n\to\infty}\left(1+\frac{1}{\frac{n^2+n-1}{-4n+2}}\right)^{\frac{n^2+n-1}{-4n+2}\cdot\frac{-4n+2}{n^2+n-1}\cdot 2n} = e^{-8}$

11.- $\lim_{n\to\infty}\left(\frac{2n}{2n+1}\right)^{n+1} = (1^\infty) = \lim_{n\to\infty}\left(1+\frac{2n-2n-1}{2n+1}\right)^{n+1} = \lim_{n\to\infty}\left(1+\frac{-1}{2n+1}\right)^{n+1} =$

$= \lim_{n\to\infty}\left(1+\frac{1}{-2n-1}\right)^{-2n-1\cdot\frac{1}{-2n-1}\cdot(n+1)} = e^{\lim_{n\to\infty}\frac{n+1}{-2n-1}} = e^{-1/2}$

12.- $\lim\limits_{n\to\infty}\dfrac{\sqrt{n^2+4}-n}{2n-1}$ $= \lim\limits_{n\to\infty} \dfrac{(\sqrt{n^2+4}-n)(\sqrt{n^2+4}+\sqrt{n})}{\sqrt{n^2+4}+\sqrt{n}} = \lim\limits_{n\to\infty} \dfrac{4}{\sqrt{n^2+4}+\sqrt{n}} = 0$

13.- $\lim\limits_{n\to\infty}\sqrt[3]{\dfrac{-8n^4-5n+1}{n^4+6n^2+3}}$ $= \sqrt[3]{-8} = -2$

14.- $\lim\limits_{n\to\infty}\dfrac{1+4+7+\dots\dots\dots+(3n-2)}{5n^2+6}$ $= \lim\limits_{n\to\infty} \dfrac{\dfrac{1+(3n-2)}{2}\cdot n}{5n^2+6} = \lim\limits_{n\to\infty} \dfrac{3n^2-n}{10n^2+12} = \dfrac{3}{10}$

$a_n = (3n-2)$ P. ARITMÉTICA

$S_n = \dfrac{(a_1+a_n)\cdot n}{2}$

15.- $\lim\limits_{n\to\infty}\dfrac{2+\dfrac{5}{n}}{4-\dfrac{3}{n^2}}$ $= \dfrac{2}{4} = \dfrac{1}{2}$

16.- $\lim\limits_{n\to\infty}\left(1-\dfrac{2}{n}\right)^{\frac{1}{n}-2}$ $= (1)^{-2} = 1$

17.- $\lim\limits_{n\to\infty}\left[\left(4^{1/n}\right)^{2n}+\sqrt{3+\dfrac{1}{n}}\right]$ $= \lim\limits_{n\to\infty}\left(4^{\frac{2n}{n}}+\sqrt{3+\frac{1}{n}}\right) = \lim\limits_{n\to\infty}\left(4^2+\sqrt{3+\frac{1}{n}}\right) =$

$= 16+\sqrt{3}$

18.- $\lim\limits_{n\to\infty}\left(\dfrac{2n+5}{n+4}\right)^{n/2}$ $= 2^{\infty} = \infty$

19.- $\lim\limits_{n\to\infty}\dfrac{4n-6}{2n^2+7n+1} = 0$

20.- $\lim\limits_{n\to\infty}\dfrac{1+3+5+\dots\dots\dots+(2n-1)}{3n^2} = \lim\limits_{n\to\infty}\dfrac{\frac{1+2n-1}{2}\cdot n}{3n^2} = \lim\limits_{n\to\infty}\dfrac{2n^2}{6n^2} = \dfrac{1}{3}$

$a_n = 2n-1$ P. ARITMÉTICA

$S_n = \dfrac{(a_1+a_n)\cdot n}{2}$

21.- $\lim\limits_{n\to\infty}\left(\dfrac{3n-5}{2n+6}\right)^n = \left(\dfrac{3}{2}\right)^\infty = \infty$

22.- $\lim\limits_{n\to\infty}\dfrac{\frac{1}{n}+\frac{4}{n}}{\frac{6}{n}} = \dfrac{0}{0}$ INDET. $= \lim\limits_{n\to\infty}\dfrac{\frac{5}{n}}{\frac{6}{n}} = \lim\limits_{n\to\infty}\dfrac{5n}{6n} = \dfrac{5}{6}$

23.- $\lim\limits_{n\to\infty}\dfrac{\frac{n-1}{n}-\frac{n}{n+1}}{\frac{n^2+1}{n^2}-\frac{2n+1}{2n}} = \lim\limits_{n\to\infty}\dfrac{\frac{(n-1)(n+1)-n^2}{n(n+1)}}{\frac{2(n^2+1)-(2n+1)\cdot n}{2n^2}} = \lim\limits_{n\to\infty}\dfrac{\frac{n^2-1-n^2}{n(n+1)}}{\frac{2-n}{2n^2}}$

$= \lim\limits_{n\to\infty}\dfrac{-2n^2}{n(n+1)(2-n)} = \lim\limits_{n\to\infty}\dfrac{-2n^2}{-n^3+\dots} = 0$

24.- $\lim\limits_{n\to\infty}\left(\sqrt{n^2+1}-n\right) = \lim\limits_{n\to\infty}\dfrac{(\sqrt{n^2+1}-n)(\sqrt{n^2+1}+\sqrt{n})}{(\sqrt{n^2+1}+\sqrt{n})} = \lim\limits_{n\to\infty}\dfrac{1}{\sqrt{n^2+1}+\sqrt{n}} = 0$

25.- $\lim\limits_{n\to\infty}\left(n^3-3n^2+n-200\right) = \infty$

26.- $\lim\limits_{n\leftarrow\infty}\left(\dfrac{1-3n}{4-3n}\right)^{n-2} = (1^\infty) = \lim\limits_{n\to\infty}\left(1+\dfrac{1-3n-4+3n}{4-3n}\right)^{n-2} =$

$= \lim\limits_{n\to\infty}\left(1+\dfrac{-3}{4-3n}\right)^{n-2} = \lim\limits_{n\to\infty}\left(1+\dfrac{1}{\frac{4-3n}{-3}}\right)^{\frac{4-3n}{-3}\cdot\frac{-3}{4-3n}\cdot(n-2)} =$

$= e^{\lim\limits_{n\to\infty}\frac{-3n+6}{4-3n}} = e^1 = e$

27.- $\lim\limits_{n\to\infty} \sqrt[2n]{\left(\frac{n^2+n}{n^2+3}\right)^{4n^2}} = \lim\limits_{n\to\infty}\left(\frac{n^2+n}{n^2+3}\right)^{\frac{4n^2}{2n}} = \lim\limits_{n\to\infty}\left(\frac{n^2+n}{n^2+3}\right)^{2n} =$

$= \lim\limits_{n\to\infty}\left(1+\frac{n^2+n-n^2-3}{n^2+3}\right)^{2n} = \lim\limits_{n\to\infty}\left(1+\frac{n-3}{n^2+3}\right)^{2n} = \lim\limits_{n\to\infty}\left(1+\frac{1}{\frac{n^2+3}{n-3}}\right)^{\frac{n^2+3}{n-3}\cdot\frac{n-3}{n^2+3}\cdot 2n}$

$= e^{\lim\limits_{n\to\infty}\frac{2n^2-6n}{n^3+\dots}} = e^0 = 1$

28.- $\lim\limits_{n\to\infty}\frac{\frac{n}{n-1}\cdot\frac{n-1}{n+1}}{1+\frac{2n-3}{n^2+2}} = \frac{1\cdot 1}{1+0} = 1$

29.- $\lim\limits_{n\to\infty}\sqrt[5]{\frac{27n^3+5n^2}{\frac{n^3}{9}+8}} = \left(\frac{27}{\frac{1}{9}}\right)^{1/5} = \left(\frac{3^3}{\frac{1}{3^2}}\right)^{1/5} = \left(3^5\right)^{1/5} = 3$

30.- $\lim\limits_{n\to\infty}\frac{2+4+6+\dots\dots\dots+2n}{n^3-1} = \lim\limits_{n\to\infty}\frac{\frac{2+2n}{2}\cdot n}{n^3-1} = \lim\limits_{n\to\infty}\frac{2n^2+2n}{2(n^3-1)} = 0$

$a_n = 2n$

$S_n = \frac{(a_1+a_n)n}{2}$

31.- $\lim\limits_{n\leftarrow\infty}\frac{1+2+3+\dots.+n}{n^2} = \lim\limits_{n\to\infty}\frac{\frac{1+n}{2}\cdot n}{n^2} = \lim\limits_{n\to\infty}\frac{n^2+n}{2n^2} = \frac{1}{2}$

$a_n = n$

32.- $\lim\limits_{n\to\infty}\left(4+\frac{3}{n}\right)^2 = 4^2 = 16$

33.- $\lim\limits_{n\to\infty}\left(8-\frac{3}{2^n}\right)^{1/3} = \left(8-\frac{3}{\infty}\right)^{1/3} = 8^{1/3} = 2$

34.- $\lim\limits_{n\to\infty}\left(\frac{n^4-3n^2+1}{4n^3+n-3}-\frac{n^2-1}{3n^4-2n}\right) = (\infty - 0) = \infty$

35.- $\lim_{n\to\infty}\left(\dfrac{2n+5}{n+4}\right)^{-n/2} = 2^{-\infty} = \dfrac{1}{2^{\infty}} = \dfrac{1}{\infty} = 0$

36.- $\lim_{n\to\infty}\sqrt[2n]{\dfrac{1+n}{3+n}} = \lim_{n\to\infty}\left(\dfrac{1+n}{3+n}\right)^{1/2n} = 1^{0} = 1$

37.- $\lim_{n\to\infty}\left(\dfrac{3-2n}{5-3n}\right)^{\frac{n}{n+1}} = \left(\dfrac{-2}{-3}\right)^{1} = \dfrac{2}{3}$

38.- $\lim_{n\to\infty}4^{\frac{3n-1}{6n+2}} = 4^{1/2} = 2$

39.- $\lim_{n\to\infty}\left(\dfrac{3n-1}{5n+2}\right)^{-n-3} = \left(\dfrac{3}{5}\right)^{-\infty} = \left(\dfrac{5}{3}\right)^{\infty} = \infty.$

40.- $\lim_{n\to\infty}\dfrac{1-\dfrac{n}{n+1}}{3-\dfrac{3n}{n+1}} = \lim_{n\to\infty}\dfrac{\dfrac{\cancel{n}+1-\cancel{n}}{\cancel{n+1}}}{\dfrac{\cancel{3n}+3-\cancel{3n}}{\cancel{n+1}}} = \lim_{n\to\infty}\dfrac{1}{3} = \dfrac{1}{3}$

41.- $\lim_{n\to\infty}\left[(n+1)\cdot\left(\dfrac{n^3+3}{n^3}-\dfrac{2n^2+2}{2n^2}\right)\right] = [\infty \cdot 0] = \lim_{n\to\infty}(n+1)\left(\dfrac{\cancel{2n^3}+6-\cancel{2n^3}-2n}{2n^3}\right) =$

$= \lim_{n\to\infty}\dfrac{(n+1).(6-2n)}{2n^3} = \lim_{n\to\infty}\dfrac{-2n^2+\dots}{2n^3} = 0$

42.- $\lim_{n\to\infty}\left(\dfrac{n^4-n}{2n-1}-\dfrac{n^2}{n+1}\right) = [\infty - \infty] = \lim_{n\to\infty}\dfrac{(n^4-n)(n+1)-n^2(2n-1)}{(2n-1)(n+1)} =$

$= \lim_{n\to\infty}\dfrac{n^5+n^4-n^2-n-2n^3+n^2}{2n^2+\dots} = \infty$

43.- $\lim_{n\to\infty}\left(n-\sqrt{n^2-n+3}\right) = \lim_{n\to\infty}\dfrac{(n-\sqrt{n^2-n+3}).(n+\sqrt{n^2-n+3})}{n+\sqrt{n^2-n+3}} =$

$= \lim_{n\to\infty}\dfrac{n-3}{n+\sqrt{n^2-n+3}} = \dfrac{1}{2}$

44.- $\lim_{n\to\infty}\left(\sqrt{n^2+5n}-2n\right) = \lim_{n\to\infty}\dfrac{(\sqrt{n^2+5n}-2n)(\sqrt{n^2+5n}+2n)}{\sqrt{n^2+5n}+2n} =$

$= \lim_{n\to\infty}\dfrac{n^2+5n-4n^2}{\sqrt{n^2+5n}+2n} = \lim_{n\to\infty}\dfrac{-3n^2+5n}{\sqrt{n^2+5n}+2n} = -\infty$

45.- $\lim_{n\to\infty}\left(\sqrt{n}-\sqrt{2n+1}\right) = \lim_{n\to\infty} \frac{n-2n-1}{\sqrt{n}+\sqrt{2n+1}} = \lim_{n\to\infty} \frac{-n-1}{\sqrt{n}+\sqrt{2n+1}} = -\infty$

46.- $\lim_{n\to\infty}\left(\sqrt{n^3}-\sqrt{n^2+n}\right) = \lim_{n\to\infty} \frac{n^3-n^2-n}{\sqrt{n^3}+\sqrt{n^2+n}} = \infty$