a)

$$\lim_n \frac{2+3n}{5n} = \lim_n \frac{3\cancel{n}}{5\cancel{n}} = \frac{3}{5}$$

b)

$$\lim_n \frac{3n^2+4n-2}{4n^2-3n+5} = \lim_n \frac{3\cancel{n^2}}{4\cancel{n^2}} = \frac{3}{4}$$

c)

$$\lim_n \frac{3n^2+1}{4n^3+5} = \lim_n \frac{3\cancel{n^2}}{4\cancel{n^3}} = \lim_n \frac{3}{4n} = 0$$

d)

$$\lim_n \frac{3n^3+4n^2-3n+2}{4n^2+3n+2} = \lim_n 3n^3 = +\infty$$

e)

$$\lim_n 5\,(-1)^n \begin{cases} \text{-5 se n é ímpar} \\ \text{5 se n é par} \end{cases} \quad \text{Limite não existe}$$

f)

$$\lim_n \sqrt{n^3+3} = \lim_n \sqrt{n^2\left(n+\frac{3}{n^2}\right)} = \lim_n |n|\sqrt{n+\frac{3}{n^2}} = \lim_n n\sqrt{n+\frac{3}{n^2}} = +\infty$$

g)

$$\lim_n \frac{\sqrt{4n^2+1}}{n+3} = \lim_n \frac{\sqrt{n^2\left(4+\frac{1}{n^2}\right)}}{n\left(1+\frac{3}{n}\right)} = \lim_n \frac{|n|\sqrt{4+\frac{1}{n^2}}}{n\left(1+\frac{3}{n}\right)} = \lim_n \frac{\cancel{n}\sqrt{4+\frac{1}{n^2}}}{\cancel{n}\left(1+\frac{3}{n}\right)} = 2$$

h)

$$\lim_n \left(\frac{1}{\sqrt{n^2+1}} - \frac{1}{\sqrt{n^2+2}}\right)$$

$$= \lim_n \left(\frac{1}{\sqrt{n^2+1}}\right) - \lim_n \left(\frac{1}{\sqrt{n^2+2}}\right)$$

$$0 - 0 = 0$$

i)

$$\lim_n \left(\frac{1}{\sqrt{n^4+2}-\sqrt{n^4+3}}\right) = \lim_n \frac{\sqrt{n^4+2}+\sqrt{n^4+3}}{\left(\sqrt{n^4+2}-\sqrt{n^4+3}\right)\left(\sqrt{n^4+2}+\sqrt{n^4+3}\right)}$$

$$= \lim_n \frac{\sqrt{n^4+2}+\sqrt{n^4+3}}{-1}$$

$$= -\lim_n \sqrt{n^4+2}+\sqrt{n^4+3}$$

$$= -\lim_n \sqrt{n^4\left(1+\frac{2}{n^4}\right)} + \sqrt{n^4\left(1+\frac{3}{n^4}\right)} = -\lim_n |n|\sqrt{1+\frac{2}{n^4}} + |n|\sqrt{1+\frac{3}{n^4}} = -\infty$$

j)

$$\lim_n \left(\sqrt{n^2+2}-\sqrt{n^2-n}\right)$$

$$= \lim_n \frac{\left(\sqrt{n^2+2}-\sqrt{n^2-n}\right)\left(\sqrt{n^2+2}+\sqrt{n^2-n}\right)}{\left(\sqrt{n^2+2}+\sqrt{n^2-n}\right)}$$

$$= \lim_n \frac{2+n}{\left(\sqrt{n^2+2}+\sqrt{n^2-n}\right)}$$

$$= \lim_n \frac{n\left(\frac{2}{n}+1\right)}{\sqrt{n^2\left(1+\frac{2}{n^2}\right)}+\sqrt{n^2\left(1-\frac{1}{n}\right)}}$$

$$= \lim_n \frac{n\left(\frac{2}{n}+1\right)}{|n|\left(\sqrt{1+\frac{2}{n^2}}+\sqrt{1-\frac{1}{n}}\right)}$$

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

$$= \frac{1}{2}$$

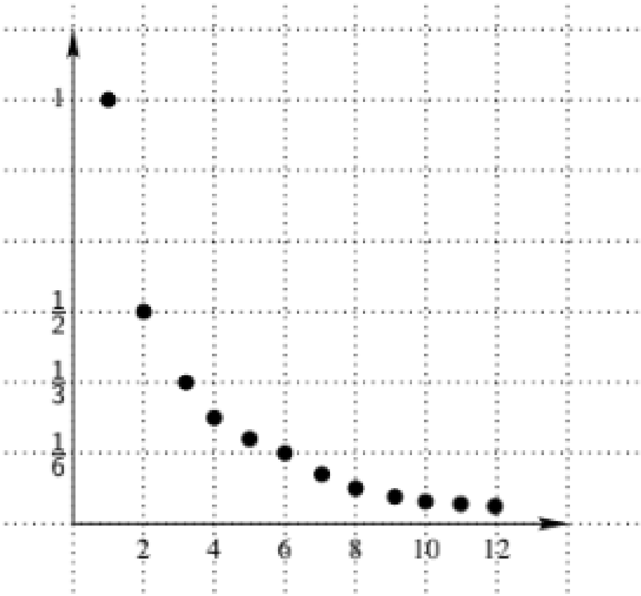

Figura 1:
$a_n = \frac{1}{n}$
É limitada e monótona portanto convergente

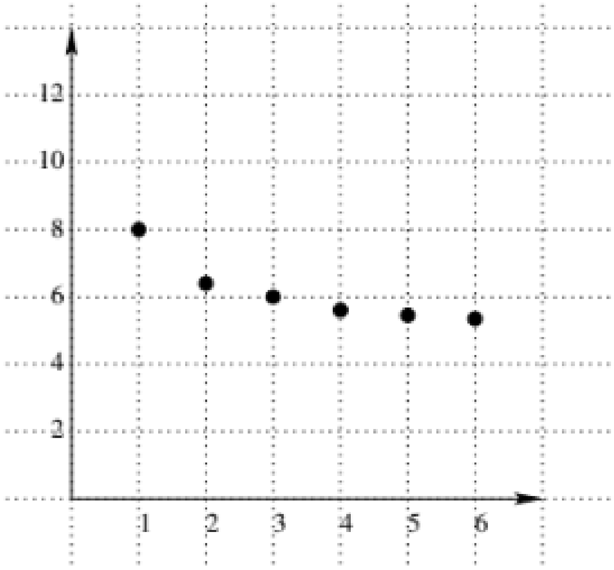

Figura 2:
$b_n = \frac{5n+3}{n}$
É limitada,monótona e por isso convergente

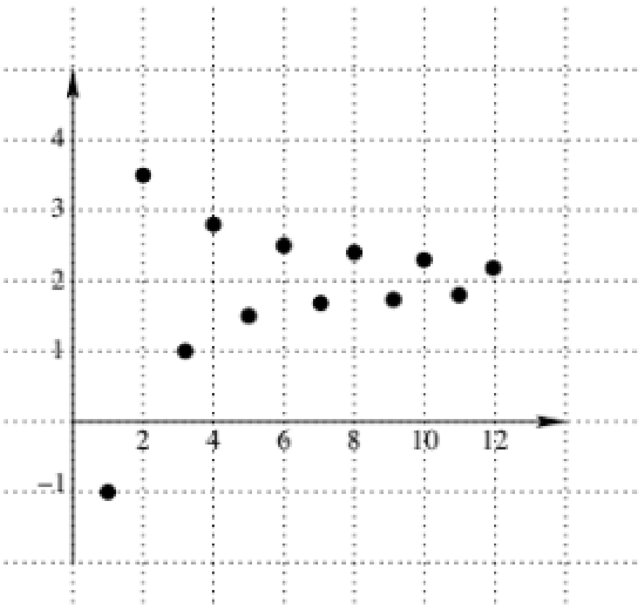

Figura 3:
$c_n = \frac{3(-1)^n+2n}{n}$
É limitada, não monótona mas convergente

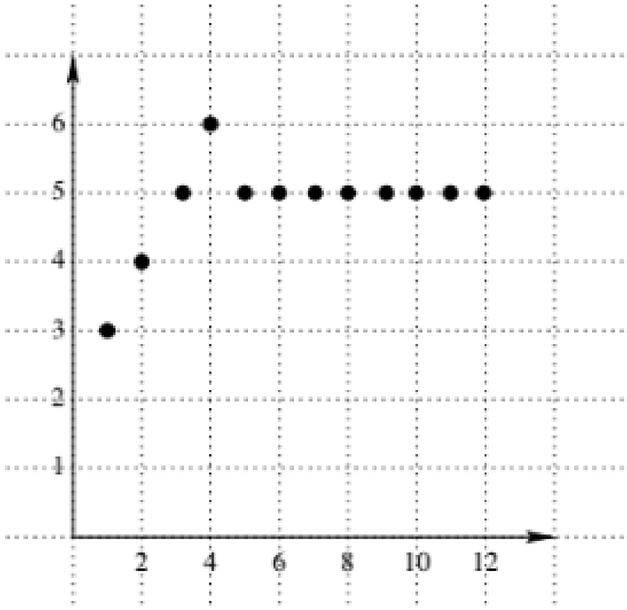

Figura 4:

$$d_n = \begin{cases} \text{n+2, se n} \leq 5, \\ \text{5, se n} \geq 5; \end{cases}$$

É limitada, não monótona mas convergente

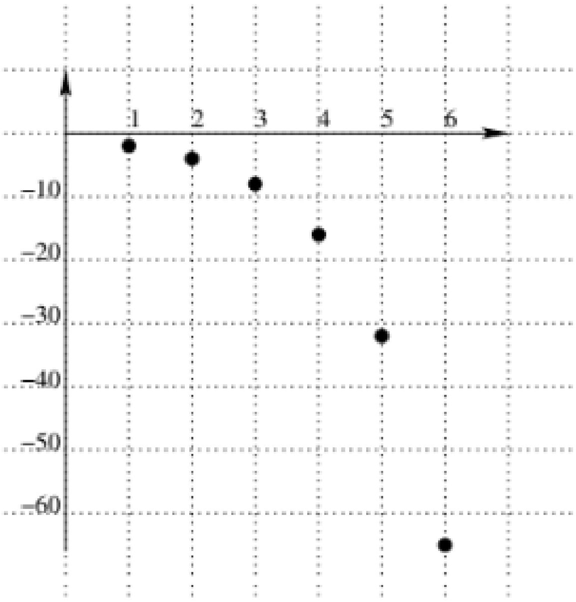

Figura 5:

$e_n = -2^n$

É monótona, não limitada e não convergente

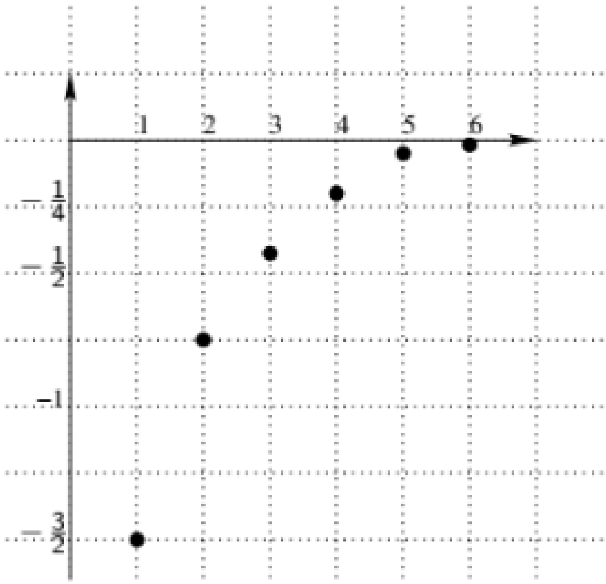

Figura 6:
$e_n = \frac{-3}{2^n}$
É limitada, monótona e por isso convergente