

Converge or diverge?

(1)

$$a_n = 5(-1)^{3n} \sim \text{diverge}$$

$$a_n = \frac{5^n}{2^n + 10} \sim \text{diverge}$$

$$a_n = \sin\left(\frac{6}{n}\right) \sim \text{Converges}$$

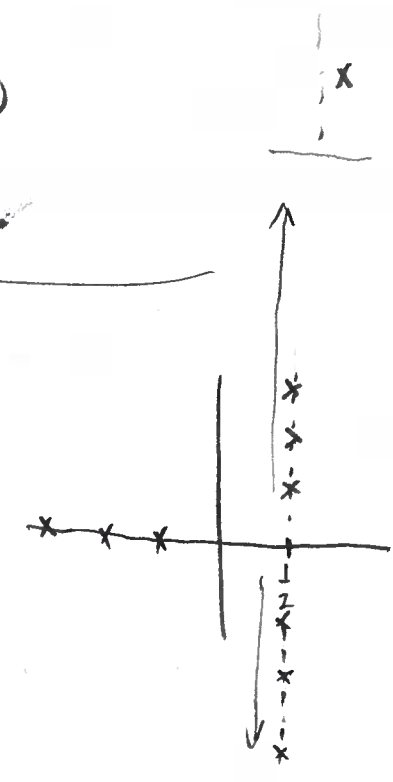
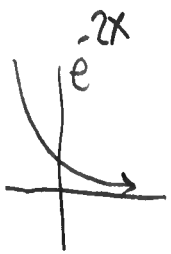
Conv or div? If conv, write limit

$$a_n = 8 - e^{-2n} \xrightarrow{\text{as } n \rightarrow \infty} 8 \quad (\text{conv}) \quad \lim_{n \rightarrow \infty} a_n = 8$$

$$a_n = \frac{\sin(n) + n^3}{\cos(n) + 2n^3} \quad (\text{conv}) \quad \lim_{n \rightarrow \infty} a_n = \frac{1}{2}$$

$$a_n = \frac{\cos(n) + n^2}{\sin(n) + n} \quad (\text{div}) \quad \text{because higher power of } n \text{ on top}$$

$$a_n = \frac{n^{50} + 8}{n + e^n} \quad (\text{converge}) \quad \lim_{n \rightarrow \infty} a_n = 0 \quad \text{because exponential beats any polynomial}$$



$-1 \leq \sin n \leq 1$
 $-1 \leq \cos n \leq 1$

$$5! = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 5 \cdot 4!$$

$$4! = 4 \cdot 3 \cdot 2 \cdot 1$$

$$a_n = \frac{(2n)!}{(2n+3)!} = \frac{\cancel{(2n)!}}{(2n+3)(2n+2)(2n+1)\cancel{(2n)!}}$$

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

$$= \frac{1}{8n^3 + \dots} \rightarrow 0$$

Ex: Write out five terms of

$$a_n = \frac{(-1)^n}{n^2+1} \xrightarrow{\text{as } n \rightarrow \infty} 0$$

$$a_1 = \frac{-1}{1^2+1} = -\frac{1}{2}$$

$$a_2 = \frac{(-1)^2}{2^2+1} = \frac{1}{5}$$

$$a_3 = \frac{-1}{10}$$

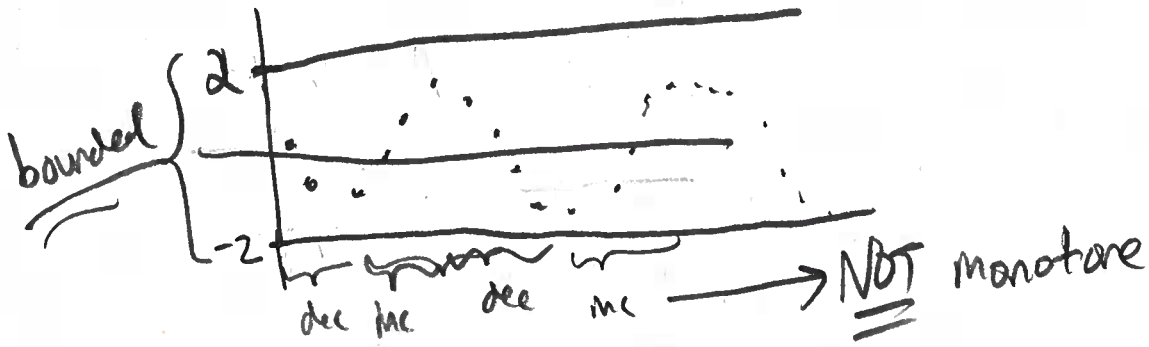
$$a_4 = \frac{1}{17}$$

$$a_5 = \frac{-1}{26}$$

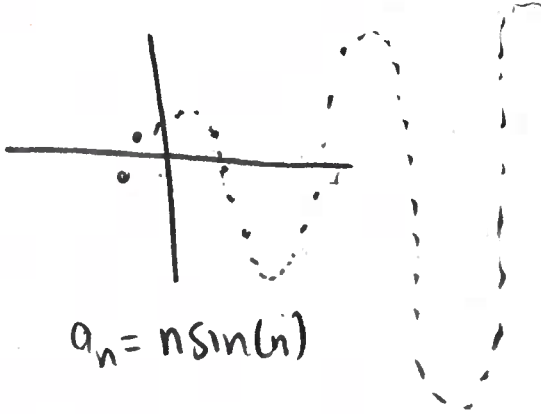
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Monotone? Bdd?

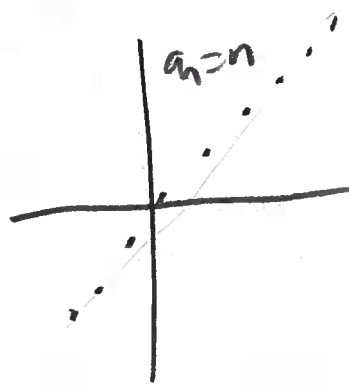
$$a_n = \frac{n^2 \cos(n)}{\sqrt{n^2 + 1}}$$



not monotone
not bdd



monotone
unbdd



monotone
bdd

