6). $-4, -\frac{8}{3}, -2, -\frac{8}{5}, \ldots$

Not Arithmetic

13) $3, 6, 12, 24, \ldots$

$\times 2 \quad \times 2 \quad - \quad - \quad -$

$f(n) = \frac{3}{2}(2^n)$

10). $\frac{30}{3}, \frac{28}{3}, \frac{26}{3}, \frac{24}{3}, \ldots$

$f(x) = -\frac{2}{3}x + \frac{32}{3}$

Convergence/Divergence.

ex. 0, 1, 2, 3, 4, 5, 6, . . .

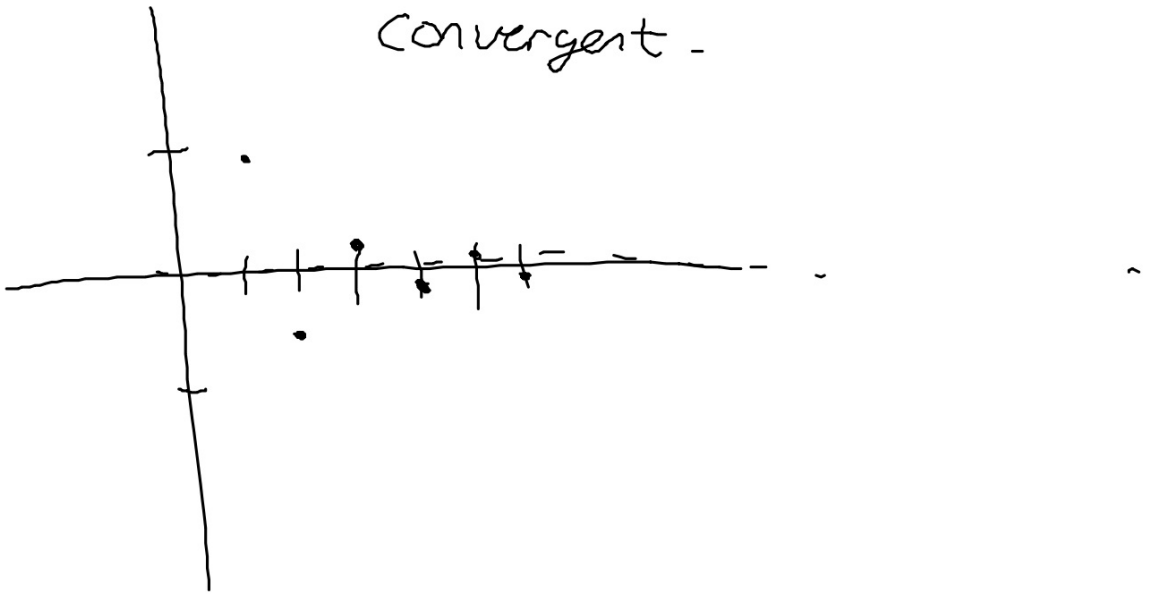
divergent.

n	1	2	3	4	. . .
ex. $f(n)$	1,	$-\frac{1}{2}$,	$\frac{1}{3}$,	$-\frac{1}{4}$,	$\frac{1}{5}$,	$-\frac{1}{6}$, . . .

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

$f(n)=(-1)^{n}\frac{1}{n}$.

convergent.



Convergent expressions ($n \to \infty$)

a) $\frac{1}{n} = \frac{1n^0}{n^1}$

b) $\frac{n^a}{n^b}$ given $b > a$.

c) $\frac{cn^a + \cdots}{dn^a + \cdots}$ Converges to $\frac{c}{d}$

ex. $\frac{n^3+4}{n^2+4n+6}$

ex. $1, \frac{1}{4}, \frac{1}{9}, \frac{1}{16}, \frac{1}{25}, \ldots$

$\Rightarrow f(n) = \frac{1}{n^2}$ Convergent.

ex. $(1, \frac{4}{2}, \frac{9}{3}, \frac{16}{4}, \frac{25}{5}, \ldots$

$= 1, 2, 3, 4, \ldots$

$f(n) = \frac{n^2}{n_9}$ divergent.

ex. $\frac{1}{1}, \frac{4}{8}, \frac{9}{27}, \frac{16}{64}, \frac{25}{125}, \ldots$ Convergent

$f(n) = \frac{n^2}{n^3}$

Determine if the following functions are convergent. If so, then find their value of convergence. → Limit of a function.

a) $\frac{14}{n}$

$= 14 \cdot \frac{1}{n}$

C ; 0

b) $\frac{12n^3}{10000000n^2}$

D

c) $\frac{n^{19} + n^{18} + 4n^{14} + 12n^{11} + 146}{n^{21} + 3}$

C ; 0

d) $\frac{(n+3)(n+31)}{2n^2 + 3}$

$n^2 + \ldots$

C ; $\frac{1}{2}$

e) $\frac{2en^4 + 3n^2 + \pi}{(2\pi n^2 + 3)(2en^2 + 3)}$

$4\pi e n^4 + \ldots$

$= \frac{1}{4\pi e}$

C ; $\frac{1}{2\pi}$

Limits

$\lim_{n \to \infty} \frac{1}{n} = 0$ C

$\lim_{n \to 0} \frac{1}{n} = \infty$ D

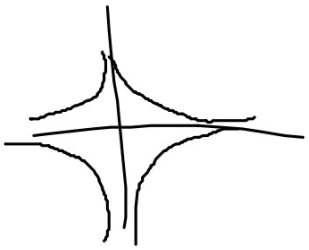
$\lim_{n \to \infty} \frac{1}{n} = 0$ C

$\lim_{n \to 0} n$ C

$\lim_{n \to \infty} n$ D

$\lim_{n \to \infty} \rightarrow \lim_{n \to -\infty}$

Not opposites.



Sucks

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7) $\frac{6}{3}, \frac{1}{3}, -\frac{4}{3}, \frac{-9}{3}$

$-\frac{5}{3} \quad -\frac{5}{3} \quad -\frac{5}{3}$

$f(x) = -\frac{5}{3}x + \frac{11}{3}$

$\frac{-12}{3}, \frac{-8}{3}, \frac{-6}{3}, \frac{-8}{5}$

$+\frac{4}{3} \quad +\frac{2}{3}$

. Not Arithmetic.

Convergance/Divergence

ex. $1, 2, 3, 4, 5, 6, 7, \ldots \to \infty$. diverges.

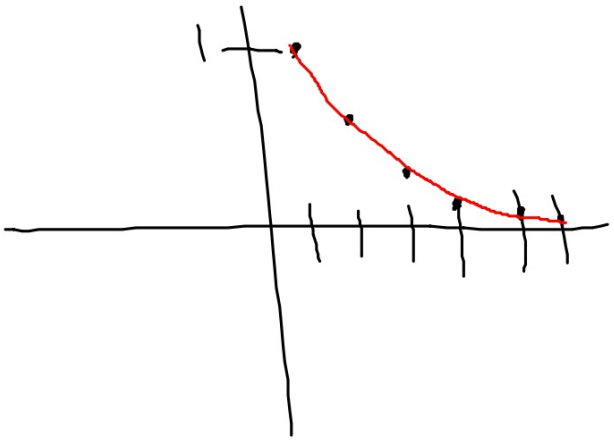
$f(n) = n$

n	1	2	3	4	5	6	...
$f(n)$	1	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{5}$	$\frac{1}{6}$	...

converges to 0.

$f(n) = \frac{1}{n}$

Limit



Convergence - A sequence is said to be convergent if there exists a certain limit (other than ∞). If a sequence does not converge, it is said to diverge.

n	1	2	3	4	5	...
	1	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{5}$	...

Q. converging to 0.

$f(n) = \frac{1}{n} \Rightarrow \boxed{\lim_{n\to\infty} \frac{1}{n} = 0}$

The limit of the function $\frac{1}{n}$ as n approaches infinity is 0.

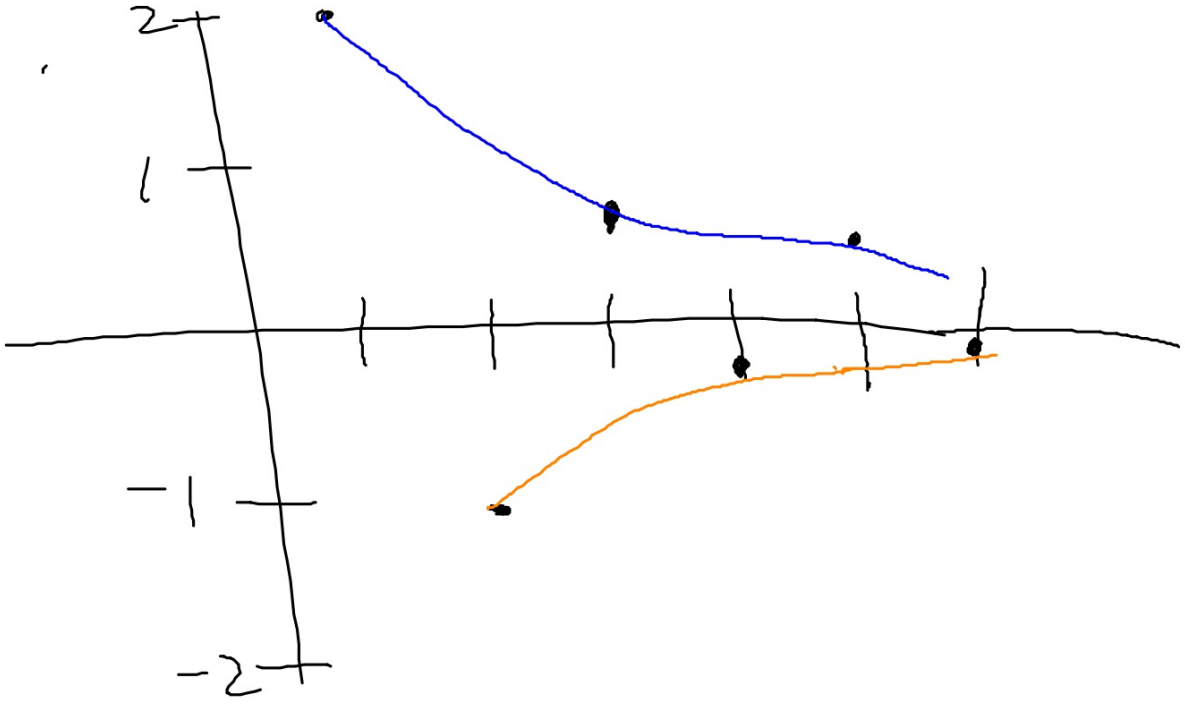
Ex. 1, 2, 3, 4, 5, 6, ...

$f(n) = n \Rightarrow \boxed{\lim_{n\to\infty} n = \infty}$

ex. $2, -1, \frac{2}{3}, \frac{-1}{2}, \frac{2}{5}, \frac{-1}{3}, \frac{2}{7}, \ldots$ $\left(\frac{1}{n}\right)$

$-2/4$ $-2/6$

$f(n) = (-1)^{n+1}\left(\frac{2}{n}\right)$ Converging to $0. \Rightarrow \lim_{n\to\infty} (-1)^{n+1}\left(\frac{2}{n}\right) = 0$



Convergent expressions $n \to \infty$.

a) $\frac{1}{n}$ converges to 0

b) $\frac{n^a}{n^b}$ given $b > a$ converges to 0.

c) $\frac{cn^a}{dn^a}$ converges to $\frac{c}{d}$.

ex: $\frac{3n^7}{1000n^7 + 1034n^3 + 111n^2 + 24987}$

Determine whether the following functions are convergent ($n \to \infty$). If they are, find their limit.

1) $\frac{14}{n}$

$= 14\left(\frac{1}{n}\right)$ C; 0

2) $\frac{n^3}{n} = \frac{n^2}{1} = n^2$ D

3) $\frac{47289\,n^{\pi}}{10000000\,n}$ D

4) $\frac{2n^4+3}{3n^4+4n^1}$

C; $2/3$

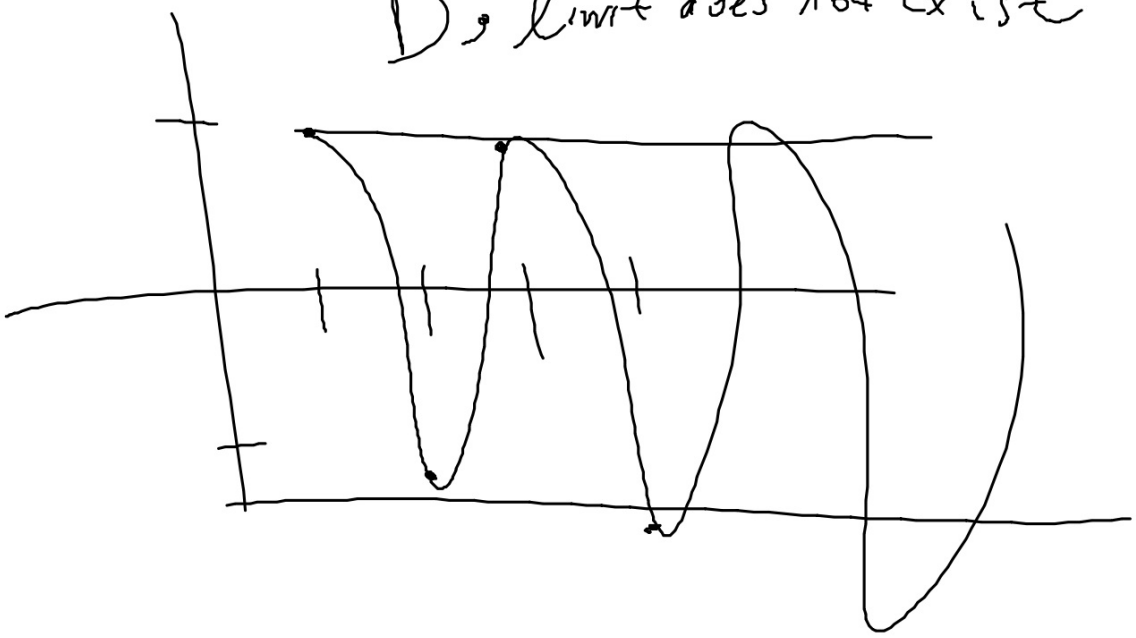
5) $\frac{2e\pi n^{27}+9n^2+4n+104742}{4en^{27}+100004249 2}$

C; $\frac{18e\pi}{24e} = \frac{\pi}{2}$

$1, -1, 1, -1, 1, -1, \ldots, -1$

$(-1)^{n+1}$

D; limit does not exist



9) $-4, \frac{-8}{3}, \frac{-12}{3}, \frac{-8}{5}$

$-\frac{12}{3} + \frac{4}{3} \quad +\frac{4}{3}$

Not Arithmetic

10) $\frac{30}{3}, \frac{28}{3}, \frac{26}{3}, \frac{24}{3}$

$-\frac{2}{3} \quad -\frac{2}{3}$

$f(n) = -\frac{2}{3}n + \frac{32}{3}$

12) $-28, -34, -40, -46$

$-6 \quad -6 \quad -6$

$f(n) = -6n - 22$

$\lim_{n\to\infty} n = \infty$ Convergence/Divergence $\lim_{n\to\infty} \frac{7n^3 - 4n^2}{n^2+4}$

for Blake only.

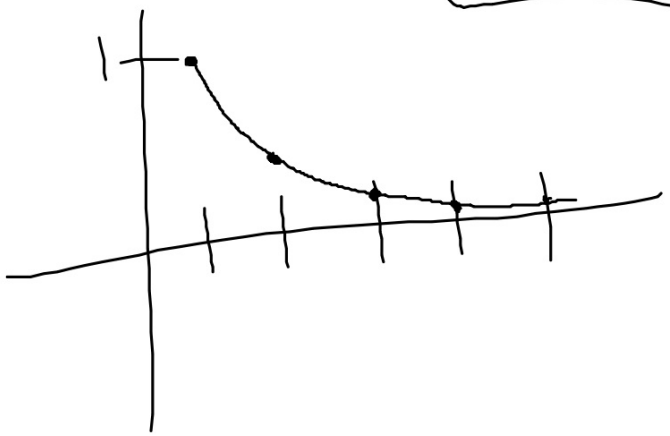
ex. 1, 2, 3, 4, 5, 6, 7, . . . $\to \infty$

$f(n) = n$ divergent.

n	1	2	3	4	. . .

ex. $f(n)$ | 1, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$) . . . Converging to 0.

$f(n) = \frac{1}{n}$ $\lim_{n\to\infty} \frac{1}{n} = 0$ Limit → Approachment.



Convergence – A sequence is said to converge if it approaches a certain number, i.e. a limit other than "$\pm\infty$" exists. A sequence diverges if it doesn't converge.

ex.

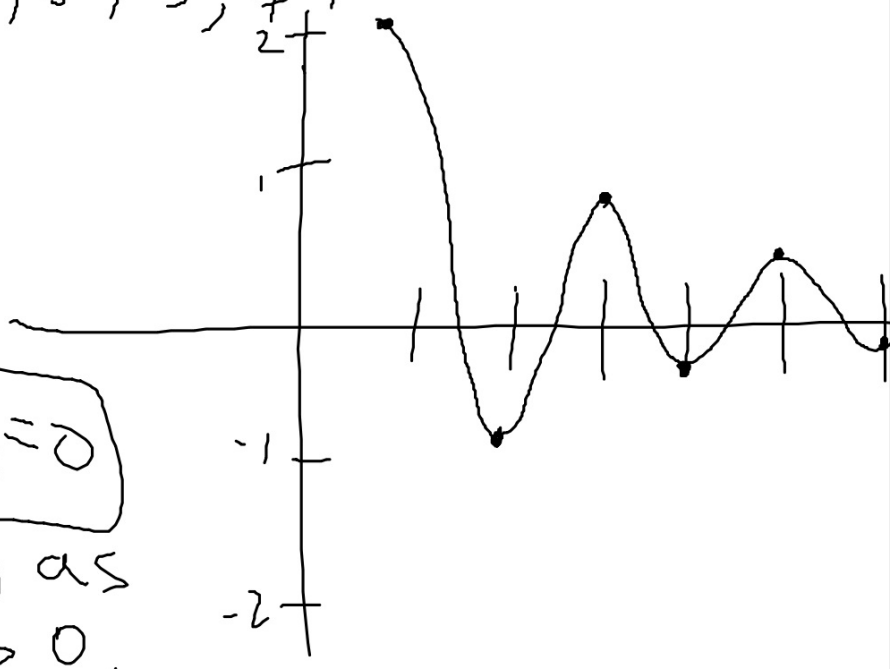
n	1	2	3	4	5	6	7	...
$f(n)$	2	-1	$\frac{2}{3}$	$-\frac{1}{2}$	$\frac{2}{5}$	$-\frac{1}{3}$	$\frac{2}{7}$	...

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

Converging to 0

$$\Rightarrow \boxed{\lim_{n\to\infty}(-1)^{n+1}\left(\frac{2}{n}\right)=0}$$

Limit of $(-1)^{n+1}\left(\frac{2}{n}\right)$ as n approaches ∞ is 0.



Convergent Expressions ($n \to \infty$).

a) $\frac{1}{n}$ (harmonic sequence) converges to 0.

b) $\frac{n^a + \dots}{n^b + \dots}$ given $b > a$. Converges to 0.

c) $\frac{c n^a + \dots}{d n^a + \dots}$ converges to $\frac{c}{d}$.

$\frac{3n^4}{19826n^4 + 4000n^2}$ $\frac{n^4}{n^4 + 3n^3 + 4n} \Rightarrow 1$

Determine whether the following functions are convergent. If so, find their limit. (Note: $n \to \infty$)

1) $\frac{14}{n} = 14\left(\frac{1}{n}\right)$

C ; 0

2) $\frac{3n^4+14}{2n^4-2n^3+1}$

C ; $\frac{3}{2}$

3) $\frac{11n^7}{6n^4-100000n^2}$

D ; ∞.

4) $\frac{14987421n^{19}}{2n^{20}}$

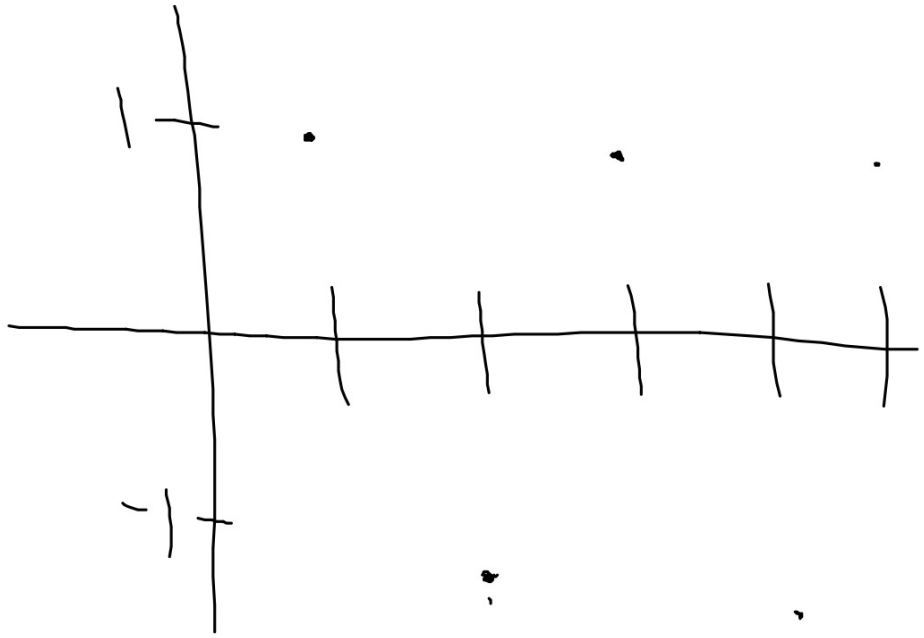
C ; 0

5) $\frac{2e\pi n^2+4n^2+11}{4en^2+111111111n^{11}}$

C ; $\frac{8e\pi}{2*e} = \frac{\pi}{2}$

Ex. $-1, 1, -1, 1, -1, 1, -1, 1 \ldots$

$f(n) = (-1)^n$ Divergent ; Limit does not exist.



$\lim_{n \to \infty} \frac{1}{n} = 0$ C

$\lim_{n \to -\infty} \frac{1}{n} = 0$ C

$\lim_{n \to 0} \frac{1}{n} = \infty$ D

$\frac{1}{1}, \frac{1}{1/2}, \frac{1}{1/8}, \frac{1}{1/19}, \ldots$

2 8 19

$\frac{1}{0.00001} = 100{,}000$

$\lim_{n \to 3} \frac{1}{n} = \frac{1}{3}$