Sequences/Limits.

Sequence - An array of numbers (finite or infinite)

ex. $1, 2, 3, 4, 5, \ldots$ infinite

$1, 2, 3, 4, 5, \ldots, 111$ finite

"a_n"

ex. $a_2 = 2^{nd}$ term

$a_3 = 3^{rd}$ term

$a_n = n^{th}$ term.

Arithmetic/Geometric. $1, 2, \pi, \pi, e, 3, -4, \ldots$

$y = mx + b$

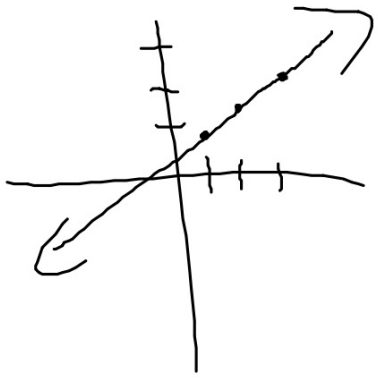
Arithmetic Sequence (Linear) – A sequence with a common difference, namely, adding or subtracting each time.

$y = a^x$ (Exponential)

Geometric Sequence – A sequence with a common ratio, namely, multiplying each time.

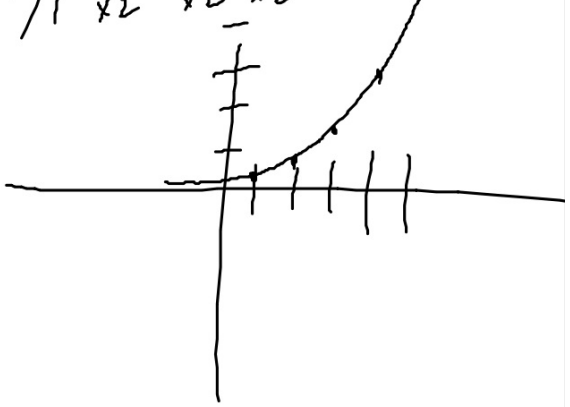
ex.

n (x-coord.)	1	2	3	4	5	6	...
$f(n)$ (y-coord.)	1	2	3	4	5	6	...



ex.

n	1	2	3	4	5	6	...
$f(n)$	$\frac{1}{4}$	$\frac{1}{2}$	1	2	4	8	...
	×2	×2	×2				



Explicit "formulas"

Arithmetic — $f(x) = y = mx + b$ ← movement.

(common diff.)

ex. $-3, 0, 3, 6, 9, 12, 15, \ldots$ (+3, +3)

$1 \quad 2 \quad 3 \quad 4$

$\therefore f(n) = 3n - 6$

ex. $0.2, 1.4, 2.6, 3.8, \ldots$ (+1.2, +1.2)

$1 \quad 2 \quad 3 \quad 4$

$f(n) = 1.2n - \square$

$-3^2 \neq 9$

Geometric — $f(x) = a^x$

$1 \quad 2 \quad 3 \quad 4 \quad \ldots$

ex. $4, 8, 16, 32, \ldots$ (×2 ×2 ×2 ...)

a

$f(x) = 2^1(2^x) = 4^x$

$= 2^{x+1}$

ex. $-12, 36, -108, \ldots$

$f(x) = 4(-3^x) = -3^{x+1}$

$f(1) = 4(-3^1) = -12$

$f(2) = 4(-3^2) = -36$

$f(x) = 4(-3)^x$

$= (-1)^n 4(3)^n$

Sequences and Series

Sequence – An array of numbers (finite or infinite).

ex. $1, 2, 3, 4, 5, 6, \ldots, 125$ (finite)

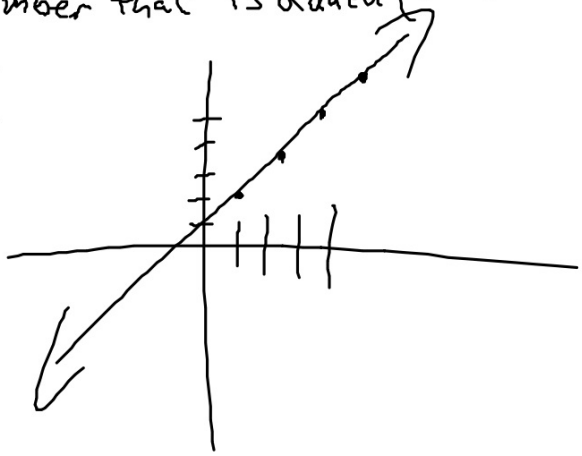
$1, 2, 3, 4, 5, 6, \ldots$ (infinite)

(Linear) Arithmetic Sequence – A sequence with a common difference, named "a_n" the number that is added (or subtracted) each tim

n (x-coord.)	1	2	3	4	5	...
ex f(n) (y-coord.)	2	3	4	5	6	...
	+1	+1	+1			...

$a_3 = 3^{rd}$ term

$f(3) = 3^{rd}$ term



Explicit formula.

$f(x) = mx + b$ ⇒ arithmetic

m → common difference

b → movement.

ex. $-2, 5, 12, 19, 26, \ldots$

1 2 3 4 5 . . .

+7 +7 +7

$f(1)$

$f(n) = 7n - 9$

ex. $0.2, 1.4, 2.6, 3.8, 5.0, \ldots$

+1.2 +1.2 + . .

$f(n) = 1.2n - 1$

Geometric Sequence – A sequence that has a common ratio, namely, the number that is multiplied (or divided) each time.

n	1	2	3	4	. . .
ex. f(n)	3,	9,	27,	81,	. . .
		×3	×3	×3	

$(a^x = (a)^x$

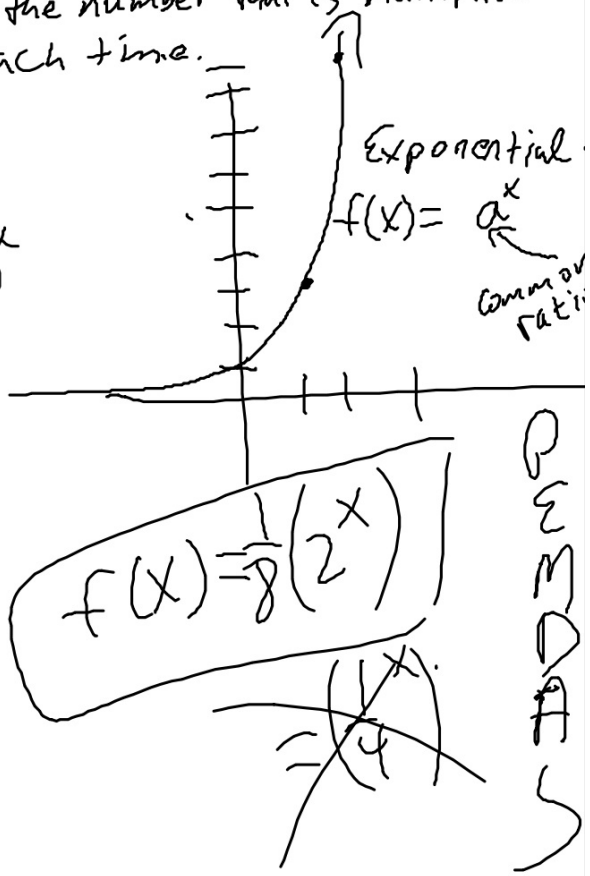
Explicit formula

$f(x) = a^x$

factor of change ← common ratio

Ex. $\frac{1}{4}, \frac{1}{2}, 1, 2, 4, 8, 16, \ldots$

×2 ×2 ×2 . . .



$f(x) = \frac{1}{8}(2^x)$

$= \left(\frac{1}{4}\right)^x$

PEMDAS

ex. $\underset{1}{-4}, \underset{2}{16}, \underset{3}{-64}, \underset{4}{256}$

$f(x) = (-4)^x$ ~~$= 4^x$~~

$f(x) = (-1)^x \, 4^x$

Sequences / Series

Sequence – An array of numbers (finite or infinite)

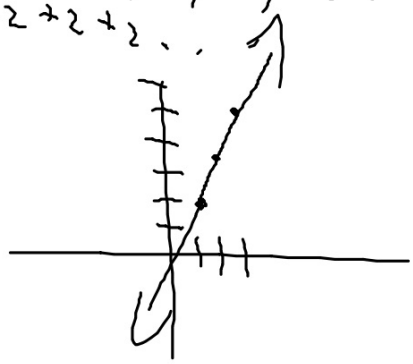
ex. $1, 2, 3, 4, \ldots, 11654$ (finite)

ex. $1, 2, 3, 4, \ldots$ (infinite)

Arithmetic Sequence – A sequence that has a common differe
Namely, the number that is added (or subtr
each time.

x-coord.	n	1	2	3	4	5	6	...
y-coord.	f(n)	2	4	6	8	10	12	...

+2 +2 +2 ...



$\sum_{n=1}^{\infty}$

Explicit Formula

ex. 0.3, 1.6, 2.9, 4.2, . . .
+1.3 +1.3 +1.3 . . .

$f(x) = mx + b$ ← movement
common difference

$f(x) = 1.3x - 1$

$f(1) = 1.3 - 1$
$= 0.3$

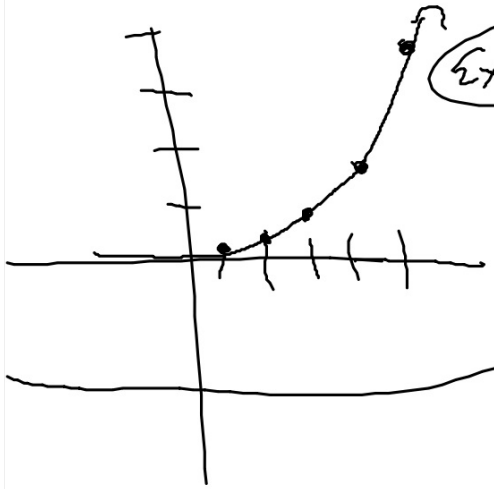
ex.
−2, 6, 14, 22, 30, . . .
+8 +8 +8 . . .

$f(x) = 8x - 10$

Geometric Sequence – A sequence that has a common ratio, namely, the number that is multiplied (or divided) each time.

Ex.

n	1	2	3	4	5	6	...
f(n)	$\frac{1}{4}$,	$\frac{1}{2}$,	1,	2,	4,	8,	...
		×2	×2	×2	...		



Explicit Formula

$f(x) = Ca^x$

C: factor of change; a: common ratio

From ex. $f(x) = \left(\frac{1}{8}\right)2^x$

$f(x) = 2^x \cdot 1/8$

$f(1) = 2 \cdot \frac{1}{8}$

$= 1/4$

$f(x) = 3(2^x) = 6^x$

$(a^x \neq (ca)^x$

ex. $-2, 6, -18, 54, -162, \ldots$

$f(x) = \frac{2}{3}(-3^x)$ $= f(1) = \frac{2}{3}(-3^1)$

$= -2$ $= a$.

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

$= -6$

$= \left(\frac{2}{3}\right)(-3)^x$

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

alternating $= (-1)^x \frac{2}{3}(3)^x$