

Sequence (1B)

- Statistical Estimation
- Arithmetic Progression Examples
- Geometric Progression Examples
- Harmonic Progression Examples
- Partial Sum and Area

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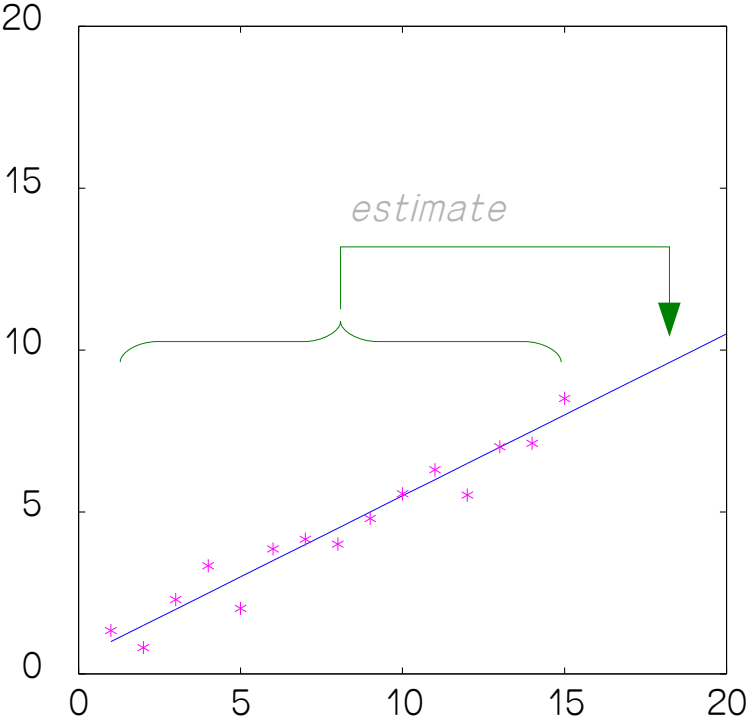
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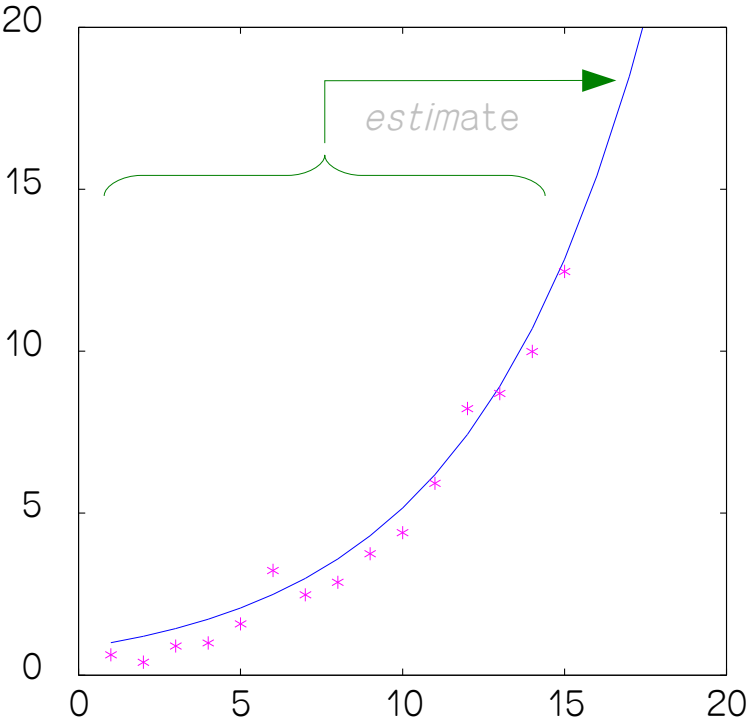
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Statistical Estimation

Linear Model

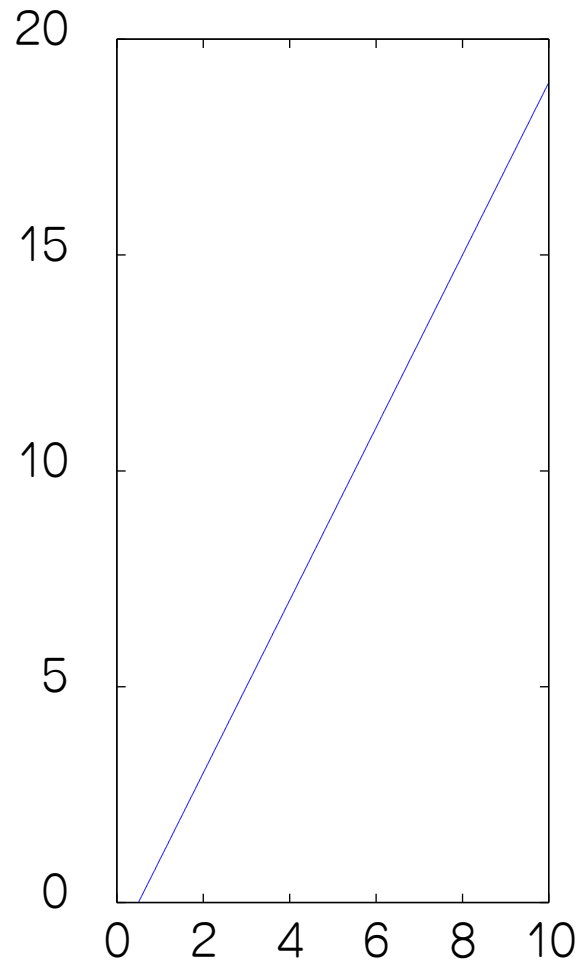


Exponential Model

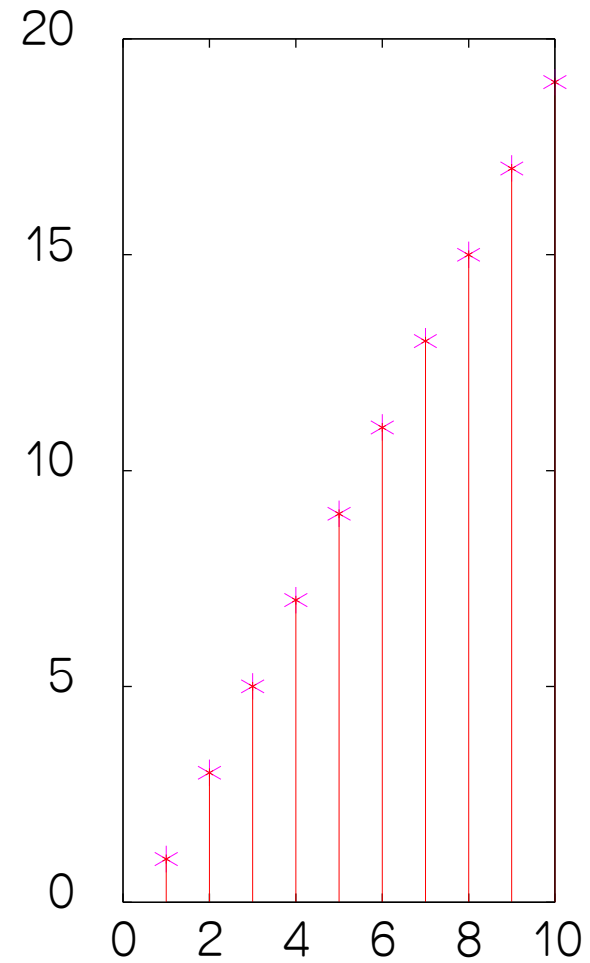


Arithmetic Progression (1)

$$y = 1 + (x - 1) \cdot 2 \quad (\text{Continuous})$$

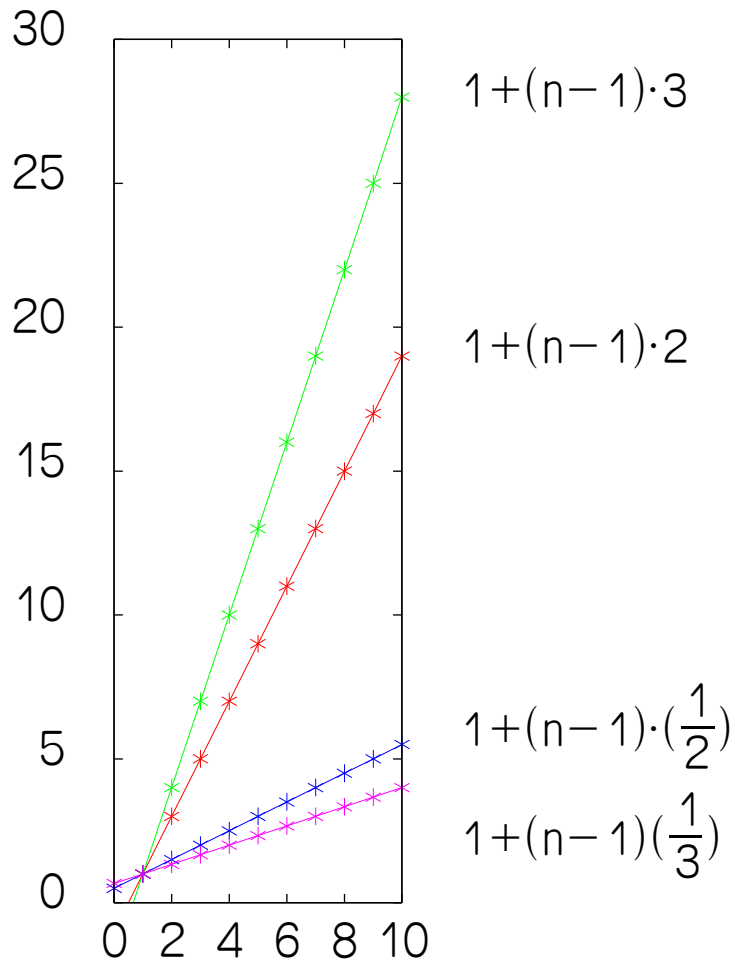


$$a_n = 1 + (n - 1) \cdot 2 \quad (\text{Discrete})$$

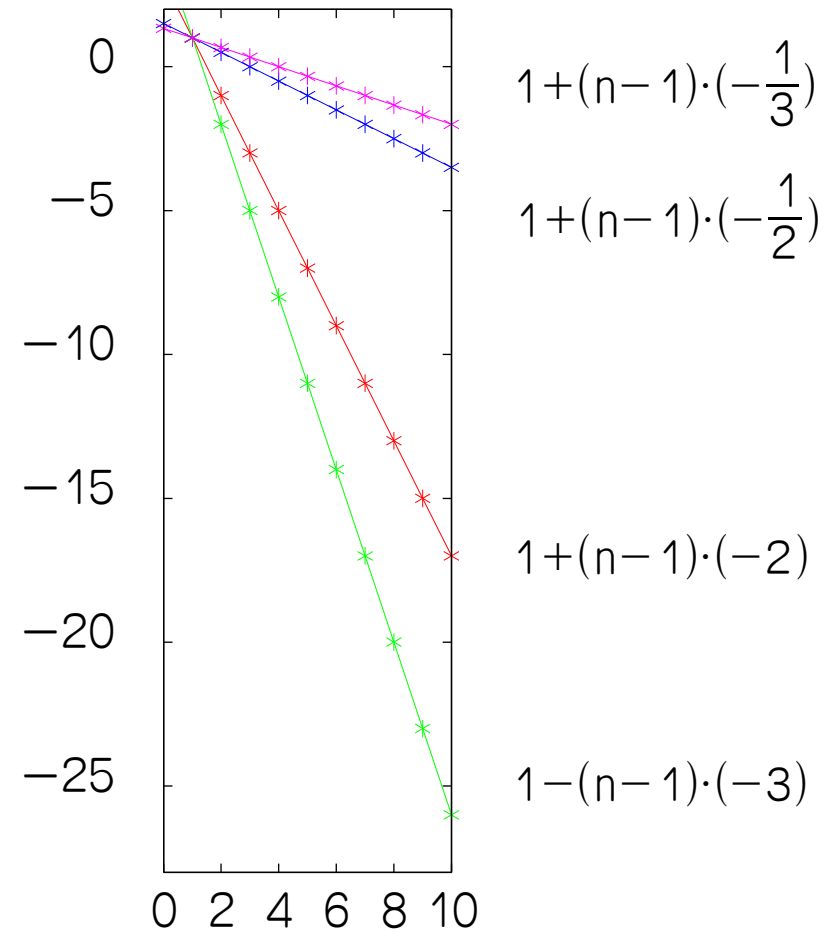


Arithmetic Progression (2)

$$a_n = a + (n-1) \cdot d \quad (d > 0)$$

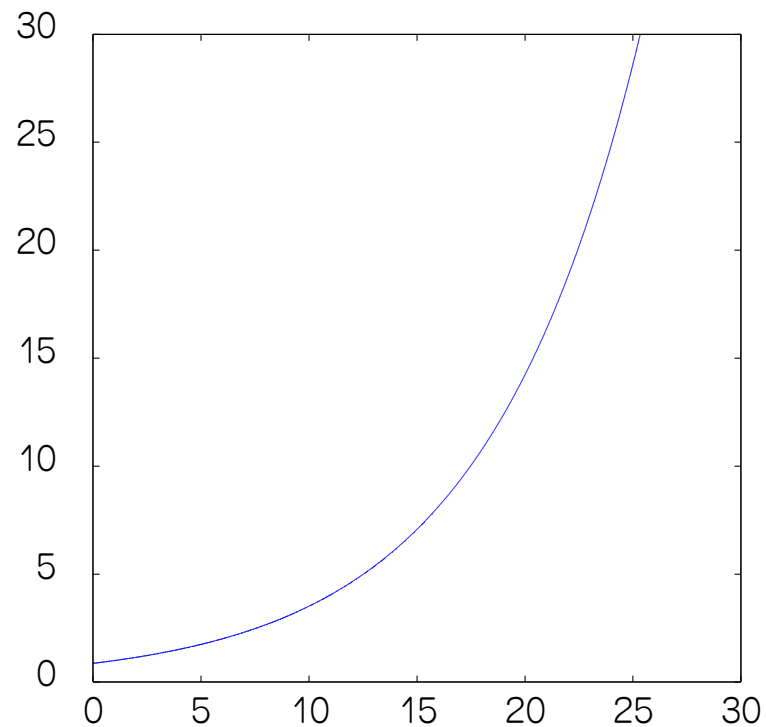


$$a_n = a + (n-1) \cdot d \quad (d < 0)$$

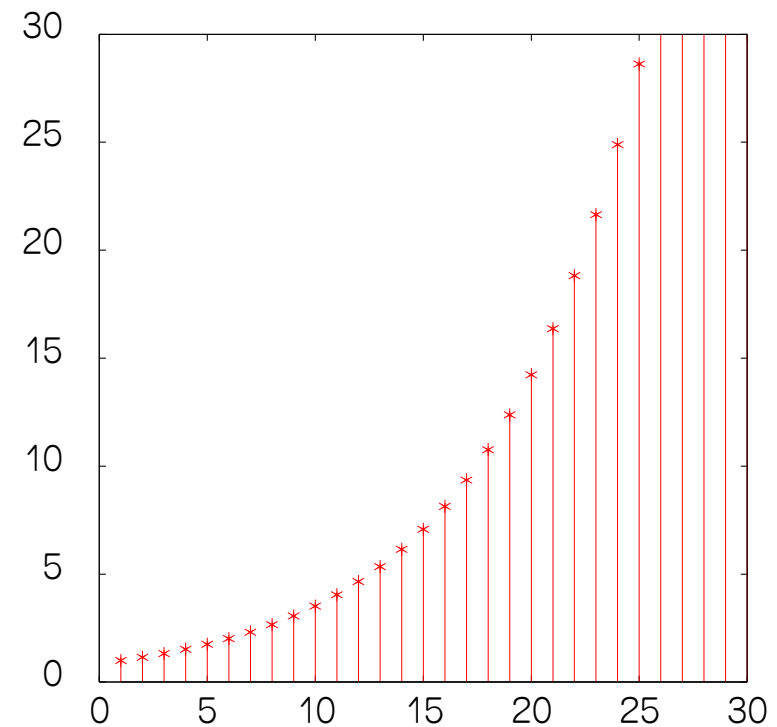


Geometric Progression (1)

$$y = 1 \cdot (1.15)^{x-1} \quad \text{(Continuous)}$$

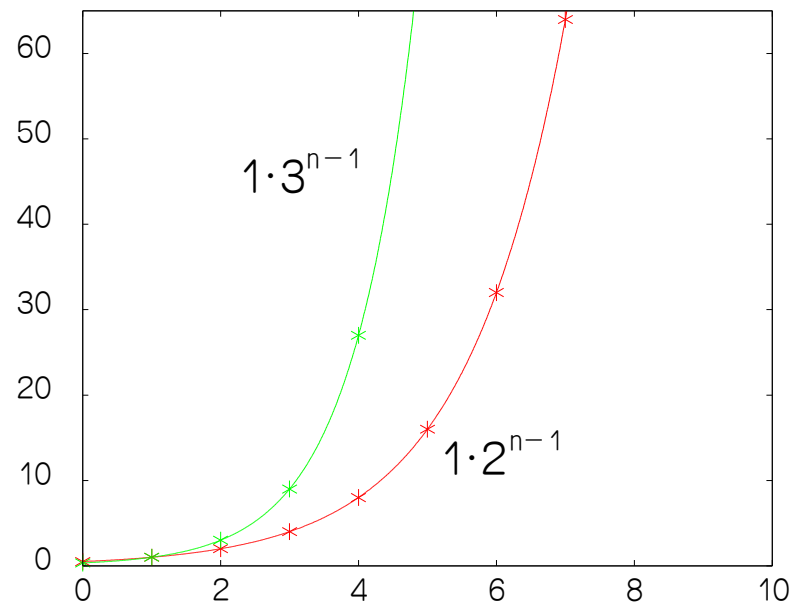


$$a_n = 1 \cdot (1.15)^{n-1} \quad \text{(Discrete)}$$

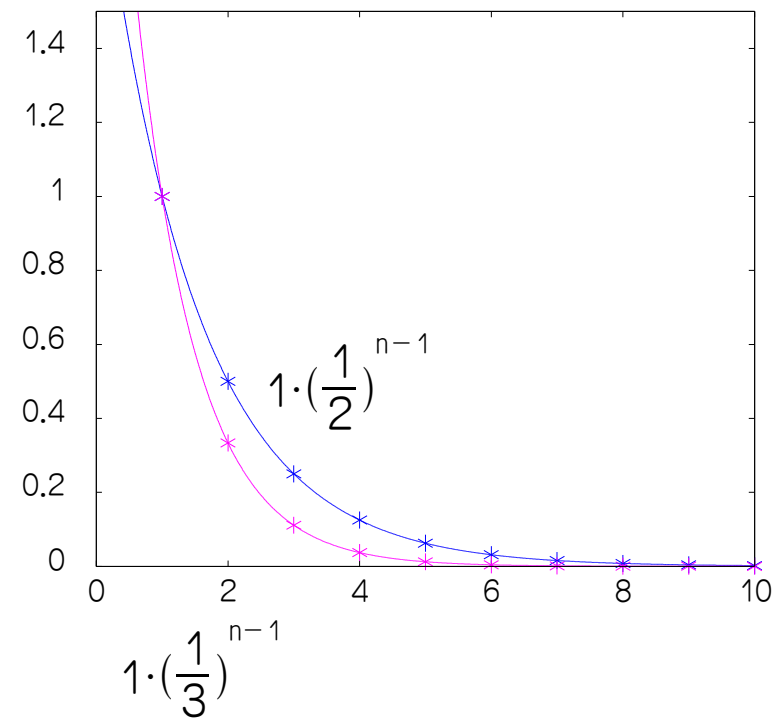


Geometric Progression (2)

$$0 < a, 1 < r$$

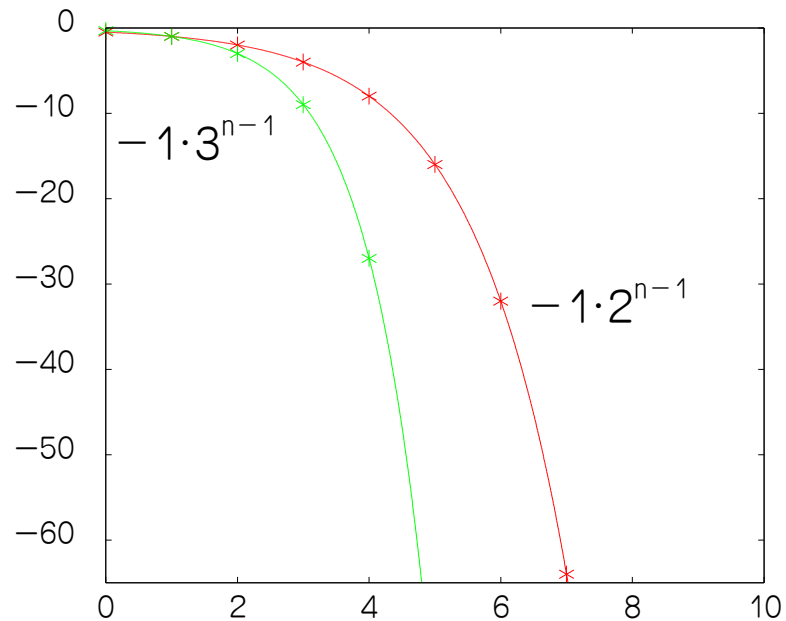


$$0 < a, 0 < r < 1$$



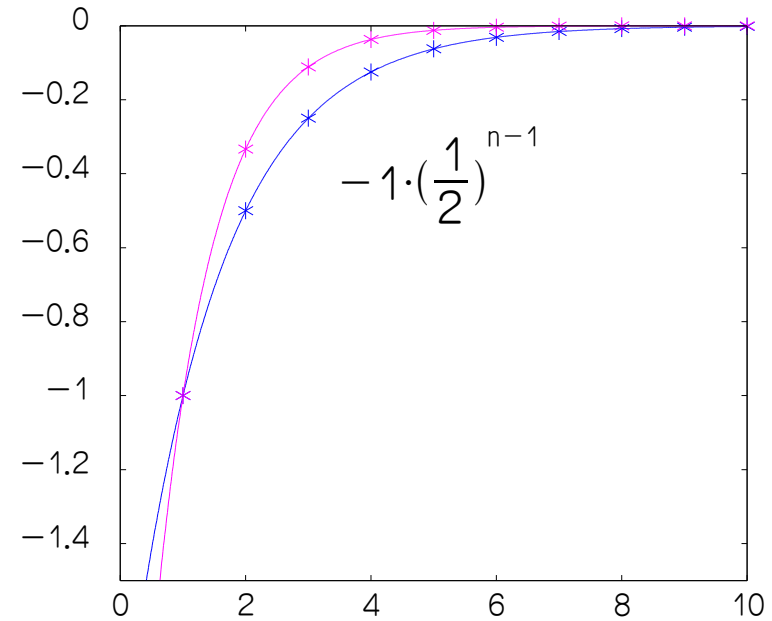
Geometric Progression (3)

$$0 < a, 1 < r$$



$$0 < a, 0 < r < 1$$

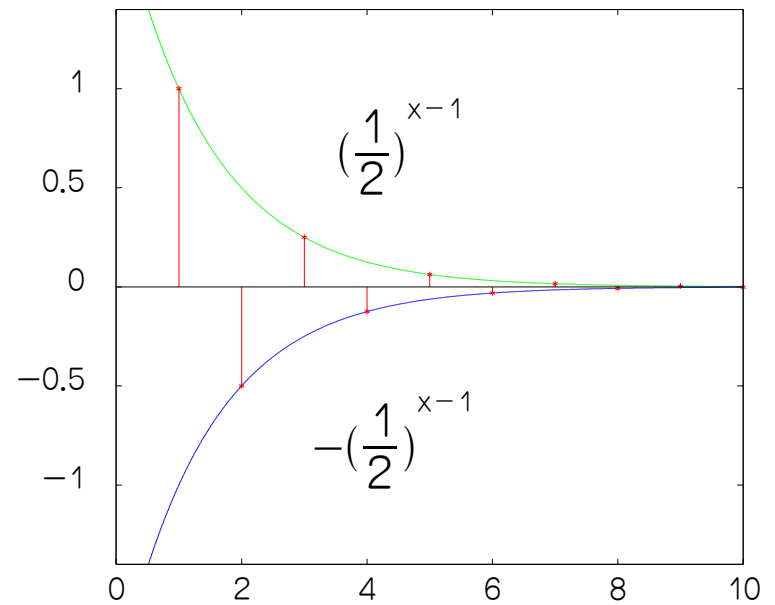
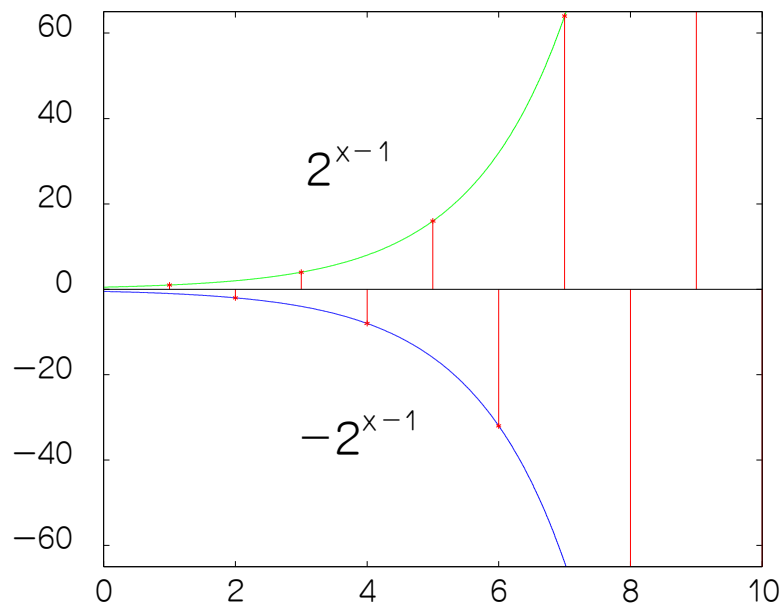
$$-1 \cdot \left(\frac{1}{3}\right)^{n-1}$$



Geometric Progression (4)

$$0 < a, r < -1 \quad 1 \cdot (-2)^{n-1}$$

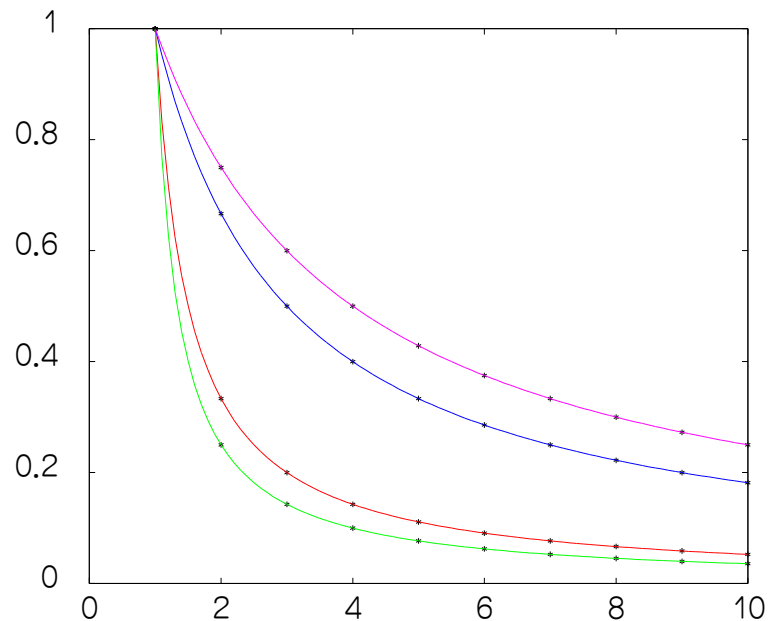
$$0 < a, -1 < r < 0 \quad 1 \cdot \left(-\frac{1}{2}\right)^{n-1}$$



Geometric Sequence: 2^n

n	2^n	n	2^n	n	2^n
0	1	10	1024	20	1048576
1	2	11	2048	21	2097152
2	4	12	4096	22	4194304
3	8	13	8192	23	8388608
4	16	14	16384	24	16777216
5	32	15	32768	25	33554432
6	64	16	65536	26	67108864
7	128	17	131072	27	134217728
8	256	18	262144	28	268435456
9	512	19	524288	29	536870912
10	1024	20	1048576	30	1073741824
	$\approx 10^3 = 1K$		$\approx 10^6 = 1M$		$\approx 10^9 = 1G$

Harmonic Progression



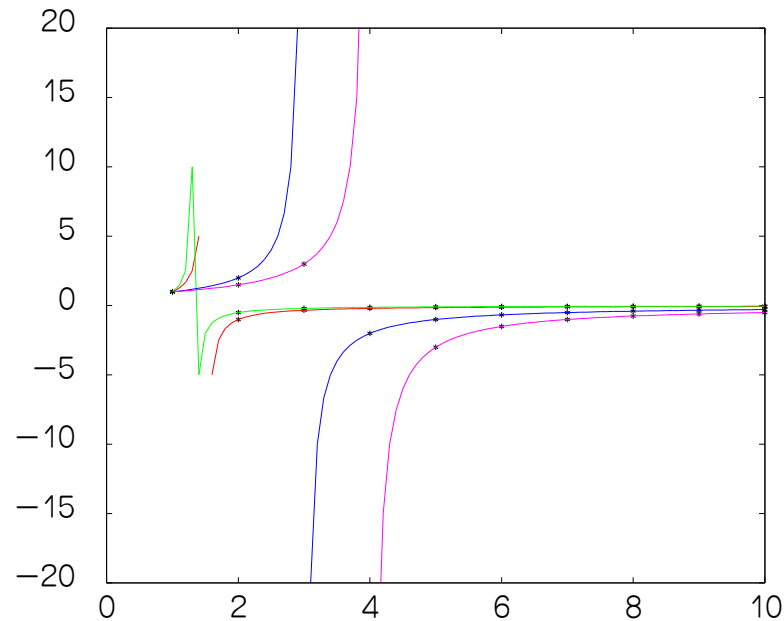
$$1 / \left\{ 1 + (n-1) \cdot \left(\frac{1}{3}\right) \right\}$$

$$1 / \left\{ 1 + (n-1) \cdot \left(\frac{1}{2}\right) \right\}$$

$$1 / \left\{ 1 + (n-1) \cdot 2 \right\}$$

$$1 / \left\{ 1 + (n-1) \cdot 3 \right\}$$

Infinity (denominator = 0)



$$1 / \left\{ 1 - (n-1) \cdot (-3) \right\}$$

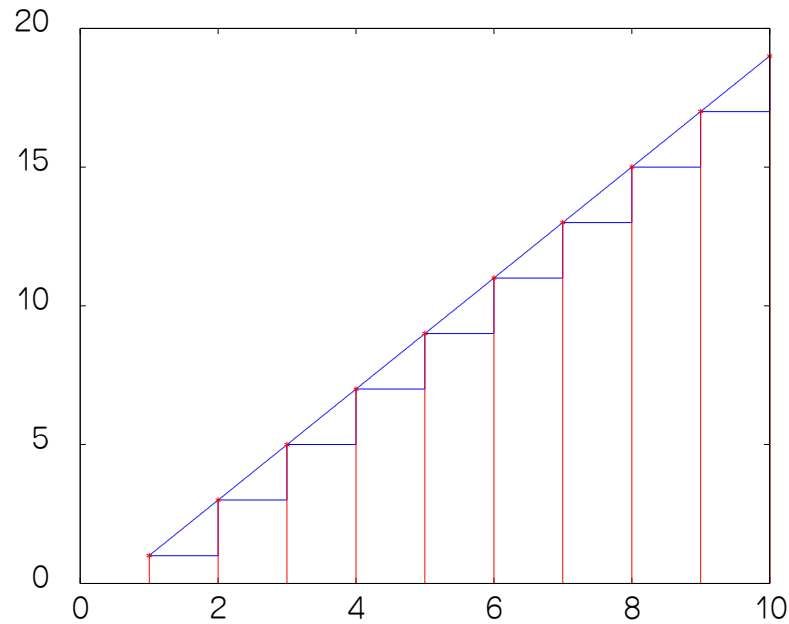
$$1 / \left\{ 1 + (n-1) \cdot (-2) \right\}$$

$$1 / \left\{ 1 + (n-1) \cdot \left(-\frac{1}{2}\right) \right\}$$

$$1 / \left\{ 1 + (n-1) \cdot \left(-\frac{1}{3}\right) \right\}$$

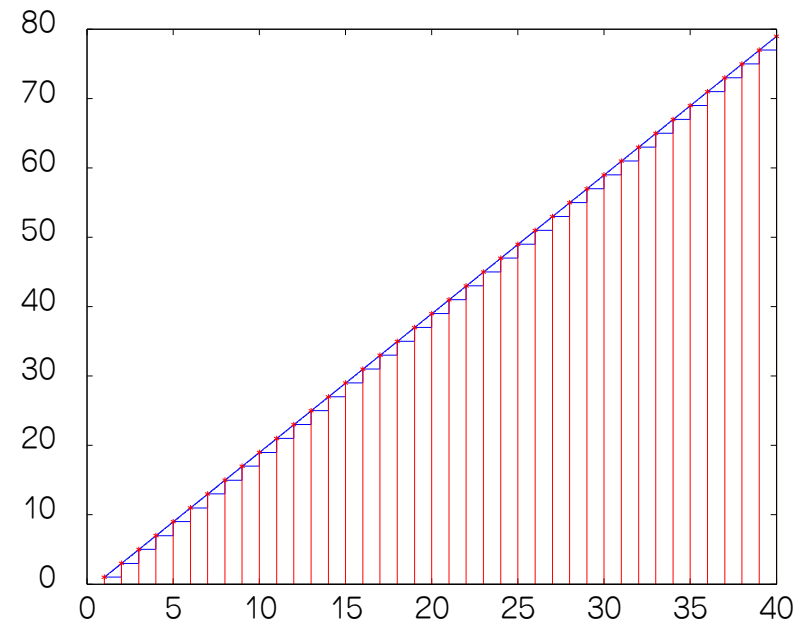
Partial Sum of A.P.

$$a_n = 1 + (n-1) \cdot 2$$



$$S_{10} = \sum_{k=1}^{10} 1 \cdot a_k \approx \text{Area}$$

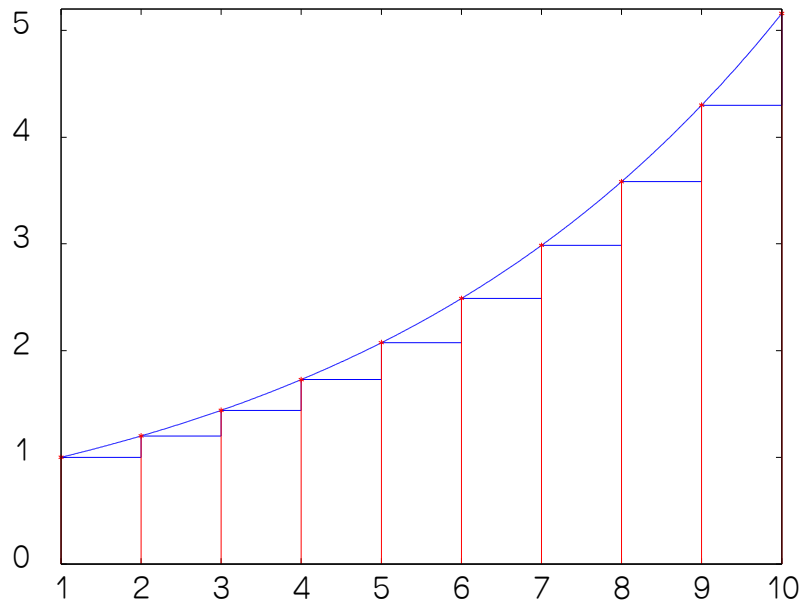
$$a_n = 1 + (n-1) \cdot 2$$



$$S_{40} = \sum_{k=1}^{40} 1 \cdot a_k \approx \text{Area}$$

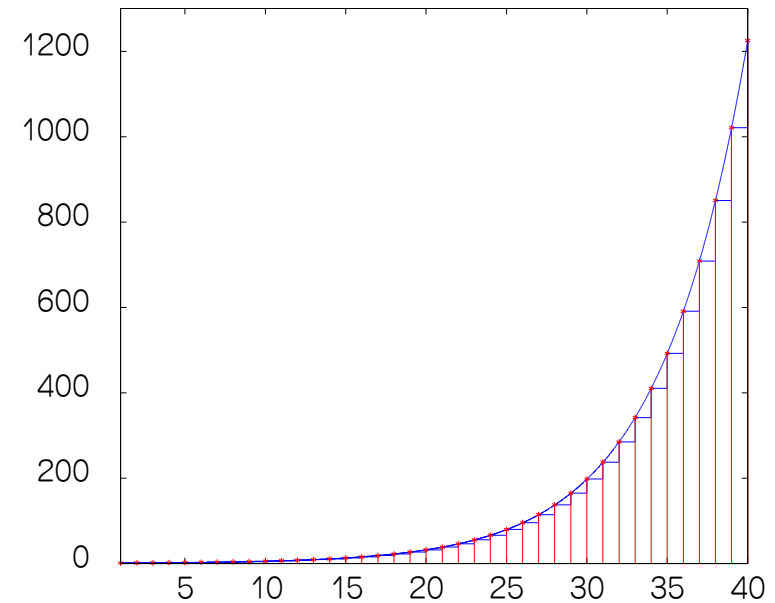
Partial Sum of G.P.

$$a_n = 1 \cdot 2^{n-1}$$



$$S_{10} = \sum_{k=1}^{10} 1 \cdot a_k \approx \text{Area}$$

$$a_n = 1 \cdot 2^{n-1}$$



$$S_{40} = \sum_{k=1}^{40} 1 \cdot a_k \approx \text{Area}$$

References

- [1] <http://en.wikipedia.org/>
- [2] <http://planetmath.org/>
- [3] Blitzer, R. “Algebra & Trigonometry.” 3rd ed, Prentice Hall
- [4] Smith, R. T., Minton, R. B. “Calculus: Concepts & Connections,” Mc Graw Hill
- [5] 홍성대, “기본/실력 수학의 정석,” 성지출판