

EXPONENTIAL GROWTH

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Exponential Growth: The original value from the range increases by the same percentage over equal increments found in the domain.

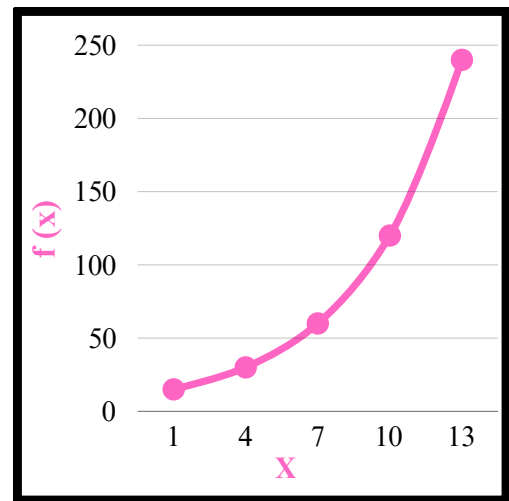
IDENTIFYING EXPONENTIAL GROWTH IN TABLES AND GRAPHS

“J” shaped graph, rapidly increasing upwards:

The same increment: +3 +3 +3 +3

X	1	4	7	10	13
f(x)	15	30	60	120	240

The same multiplier: x2 x2 x2 x2



FORMULAS OF EXPONENTIAL GROWTH

Exponential Growth Formula:

The quantity increases at a constant rate over discrete time intervals.

$$b > 1 \quad f(x) = a * b^x$$

a: initial value

b: growth factor

x: independent variable

Continuous Growth Formula:

Business application that calculates the growing investment value due to compounding.

$$y \text{ or } A(t) = a * e^{rt}$$

a: initial value

e: Euler's number

r: growth rate per unit time (decimal)

t: period or term of investment

Continuous Compounding Formula:

Continuous growth processes.

$$r > 0 \quad A(t) = P e^{rt}$$

P: initial invested

e: Euler's number

r: rate per unit time (decimal)

t: period or term of investment

Continuous Compounding: Interest is added to the principal continuously, at every infinitesimal moment, rather than at fixed intervals

Discrete Compounding: Calculating interest at specific intervals, such as monthly, quarterly, or annually.

PRACTICE PROBLEMS

Q1: A virus culture began with 300 viruses. The population size of viruses triples hourly. How many viruses will be present after 6 hours?

$$f(x) = ab^x \quad f(x) = 300(3)^6 \quad f(x) = 300(729) \quad f(x) = 218,700$$

Answer: 218,700 viruses will be present after 6 hours

Q2: In 2018, Layla invests \$5,000 in a savings account with an annual percentage rate of 7% compounded continuously. How much money will Layla have in 2024?

$$A(t) = Pe^{rt} \quad A(t) = 5000e^{0.07(6)} \quad A(t) = 5000e^{0.42} \quad A(t) = 5000(1.52196) \quad A(t) \approx 7,609.80$$

Answer: Layla will have about \$7,609.80

Q3: Layla's investment is one fourth of \$10,000. Layla's investment grows continuously at a rate of 4% annually. What is the value of the investment in 23 years?

$$y = ae^{rt} \quad y = 2500e^{0.04(23)} \quad y = 2500e^{0.92} \quad y = 2500(2.50929) \quad y \approx 6273.225$$

Answer: Layla will have about \$6,273.23

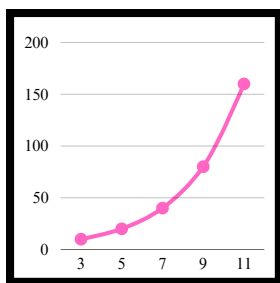
Q4: Which of the following represent exponential growth? **Answer:** (b.)

(a.)

x	0	1	2	3
f(x)	1	0.5	0.25	0.125

+1 (between x=0 and x=1)
x 1/2 (between f(0)=1 and f(1)=0.5)

(b.)



(c.)

$$f(x) = 3.46x + 3$$

(d.)

$$f(x) = 64(1 + 0.5)^2$$

1. Abramson, Jay. "Chapter 6: Exponential and Logarithm Functions." Algebra and Trigonometry 2e, 2021, pp. 544–581.

2. Roberts, Donna Roberts and Frederick. Constructing Exponential Functions - Mathbitsnotebook(A2), mathbitsnotebook.com/Algebra2/Exponential/EXConstructFunctions.html. Accessed 14 Oct. 2024.