

Math 1030 #16b

Exponential Modeling

Graphing Exponential Functions

The easiest way to graph exponential functions is to use points corresponding to several doubling times (or half-lives in the case of decay).

For growth:

Start at $(0, Q_0)$

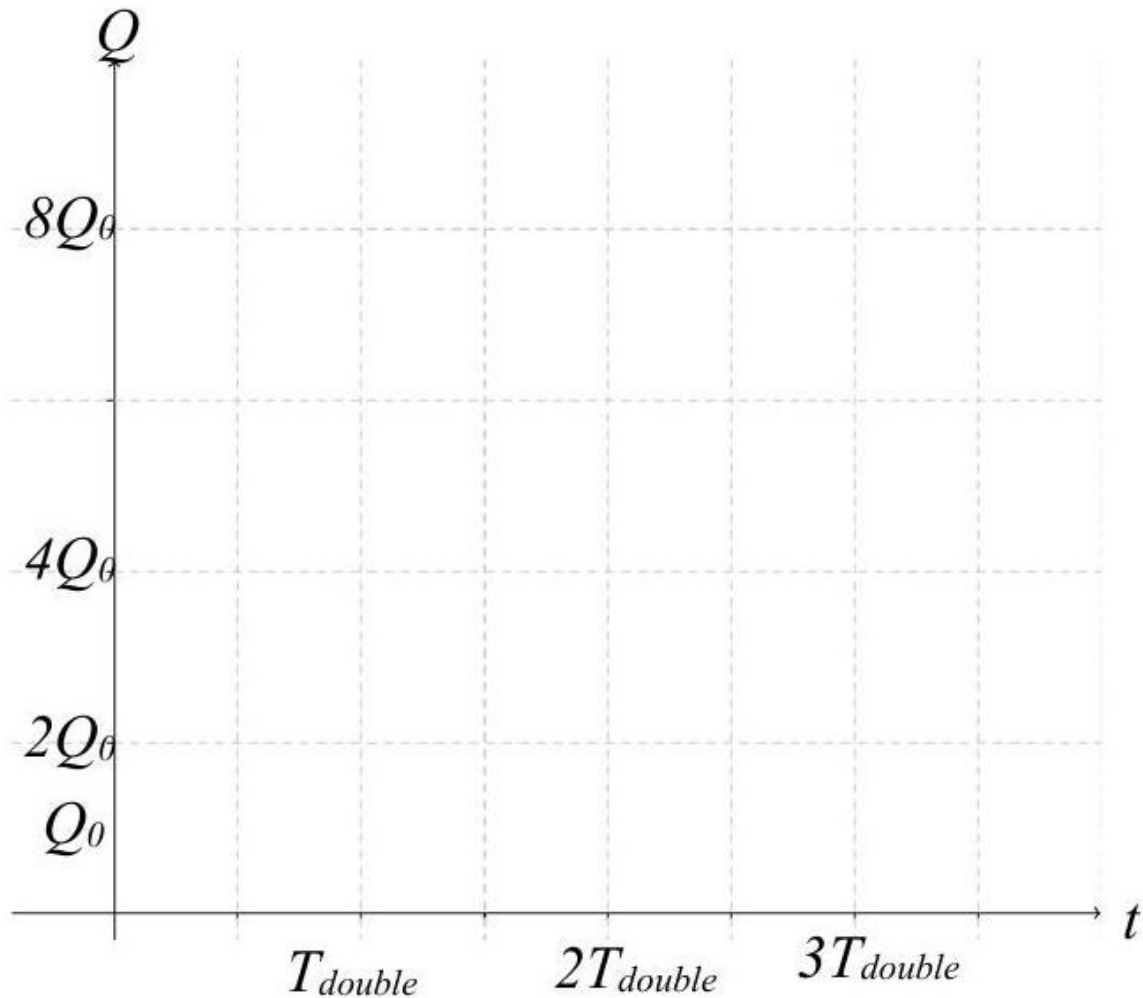
Plot $(T_{\text{double}}, 2Q_0)$,

$(2T_{\text{double}}, 4Q_0)$,

$(3T_{\text{double}}, 8Q_0)$, etc.

$$T_{\text{double}} = \frac{\log_{10} 2}{\log_{10}(1+r)}$$

$r > 0$



For decay:

Start at $(0, Q_0)$

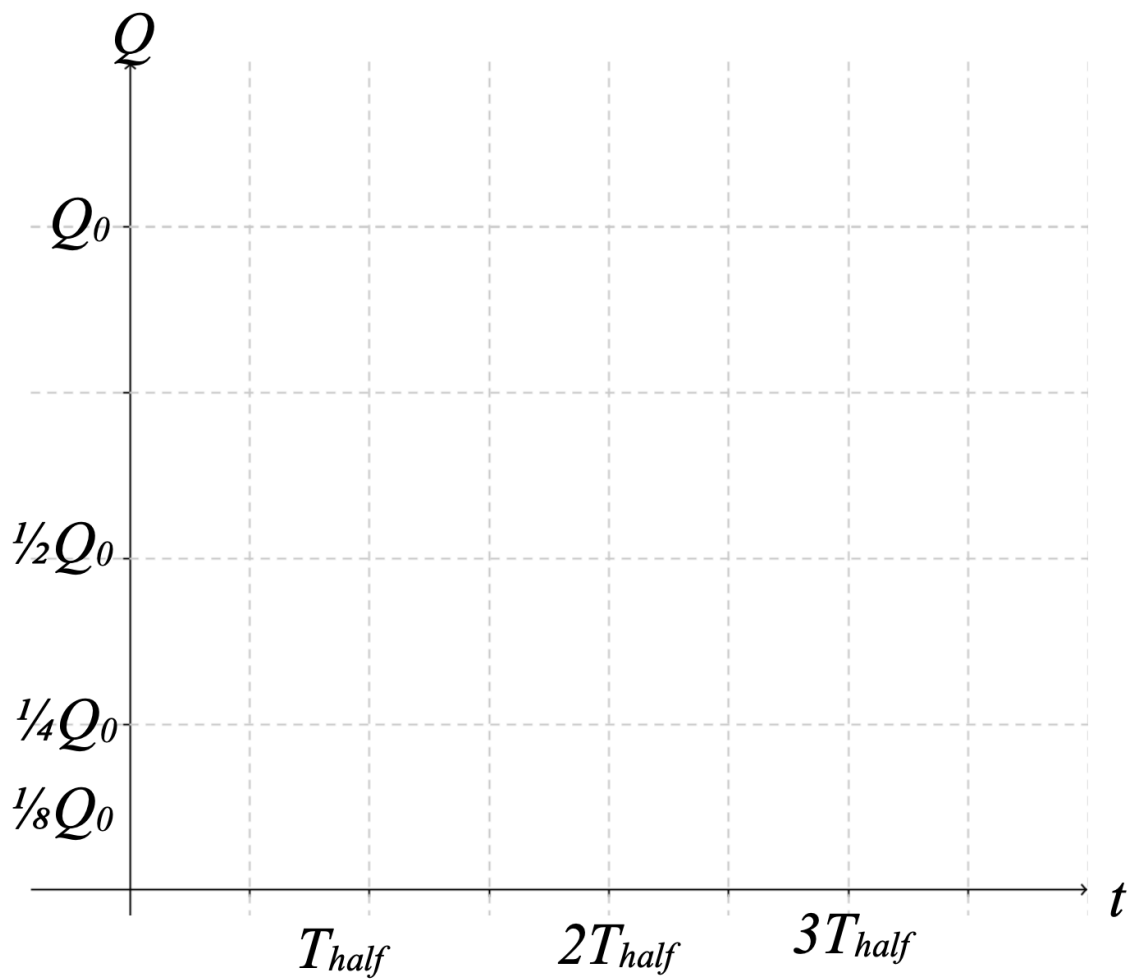
Plot $(T_{\text{half}}, \frac{1}{2}Q_0)$,

$(2T_{\text{half}}, \frac{1}{4}Q_0)$,

$(3T_{\text{half}}, \frac{1}{8}Q_0)$, etc.

$$T_{\text{half}} = -\frac{\log_{10} 2}{\log_{10} (1 + r)}$$

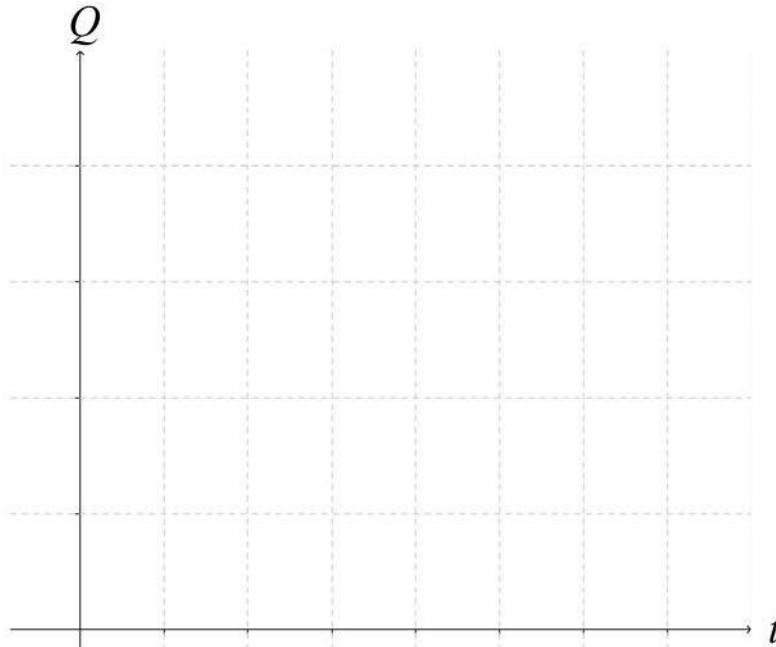
$r < 0$



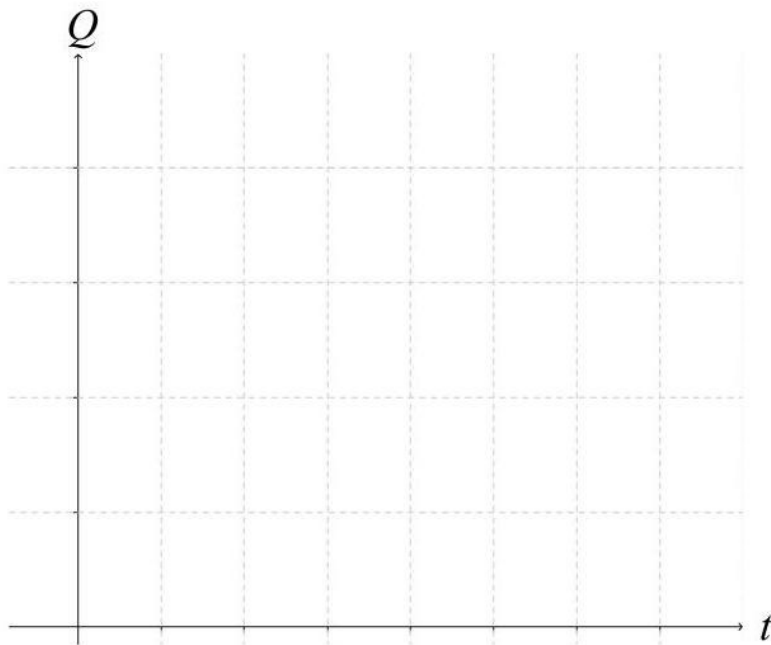
EX 1:

Graph the following equations from the previous lesson.

- a) The growth of the population of Heber, Utah is $Q = 20,000(1.15)^t$



- b) The decline of the population of Cook Islands is $Q = 11,000(0.97)^t$



Alternate Forms of the Exponential Function

$$Q = Q_0(1 + r)^t \quad \text{Note: } r \text{ is positive for growth and negative for decay.}$$

$$Q = Q_0(2)^{t/T_{\text{double}}} \text{ for growth}$$

$$Q = Q_0(1/2)^{t/T_{\text{half}}} \text{ for decay}$$

EX 2:

If the half-life of a certain Antibiotics in the bloodstream is 10 -hours. If you are given a 15 mg shot at midnight, write an equation for and sketch a graph showing the amount in your bloodstream for the next 24 hours.

