

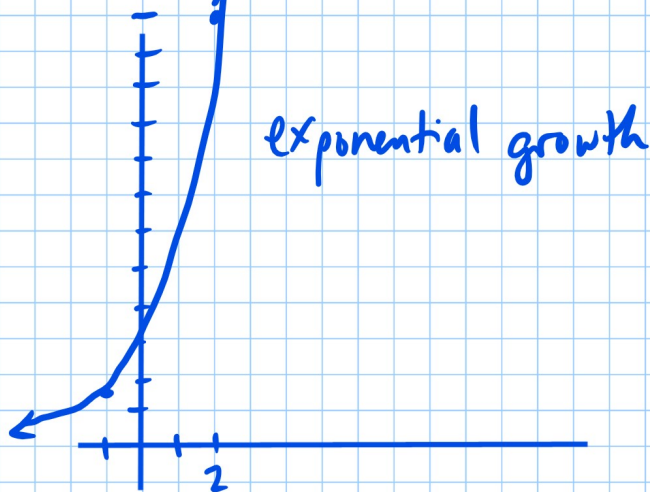
WARMUP

1) Calculate each of the following if $f(x) = 3 \cdot 2^x$

a) $f(2) = 3 \cdot 2^2 = 3 \cdot 4 = 12 \quad (2, 12)$

b) $f(-1) = 3 \cdot 2^{-1} = 3 \cdot \frac{1}{2} = \frac{3}{2} \quad (-1, \frac{3}{2})$

2) Graph $f(x) = 3 \cdot 2^x$



Section 1.2 Exponential Functions

Radioactive decay, compound interest, and population growth are exponential functions.

$P = P_0 a^t$ is an exponential function

P_0 is initial amount

$a > 0, a \neq 1$

If $a > 1$ we exponential growth

growth rate is $a - 1$

$$f(x) = 3 \cdot 1.05^x$$

initial amount

growth rate is .05 or 5%

$$f(x) = 100 \cdot 0.75^x$$

↑
Decay rate
is $1 - 0.75 = 0.25$ or 25%

If $0 < a < 1$ we have exponential decay. Decay rate is $1 - a$

Alternate Form $P = P_0 e^{kt}$ $k > 0$ for exponential growth
 k is the continuous growth rate.

$e \approx 2.72$

$e = \lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^n$ $Q = Q_0 e^{-kt}$ $k > 0$ for exponential decay
 k is the continuous decay rate.

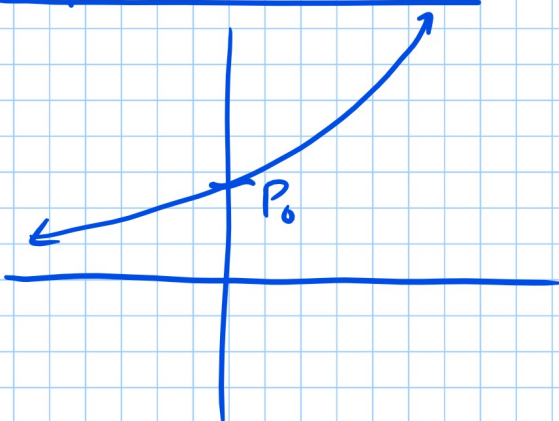
Euler

ex: $Q = 2e^{-0.5t} \Rightarrow Q = Q_0 a^t = 2 \cdot 0.61^t$

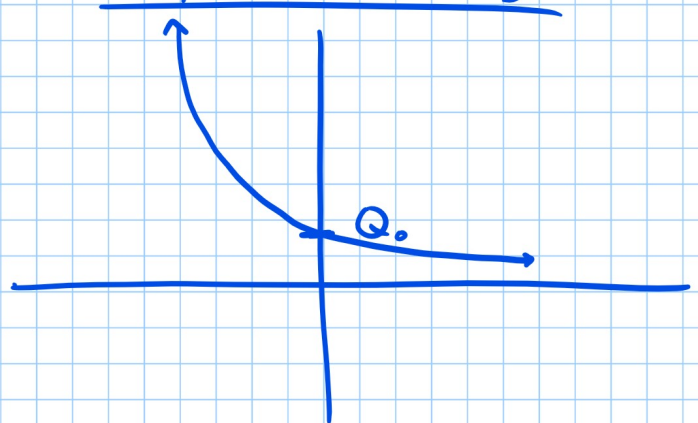
continuous decay rate = 50%

decay rate = 39%

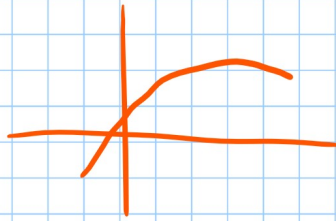
Exponential Growth



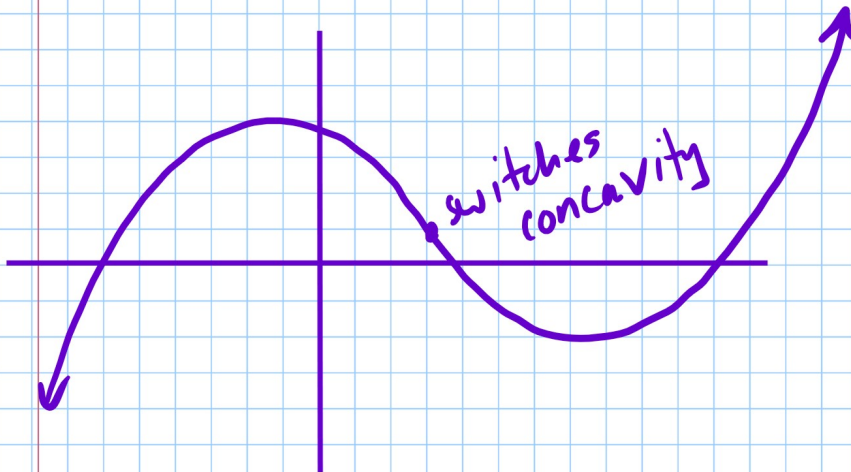
Exponential Decay



These graphs are concave up - bends upward



concave down - bends downward



ex 10 p 15

t, Q
 $(0, 30)$

a) decrease of 2 grams per day

t	Q
0	30
1	28
2	26
3	24

} linear
 $m = -2$
 $b = 30$

$$Q = -2t + 30$$

b) decrease 12% per day

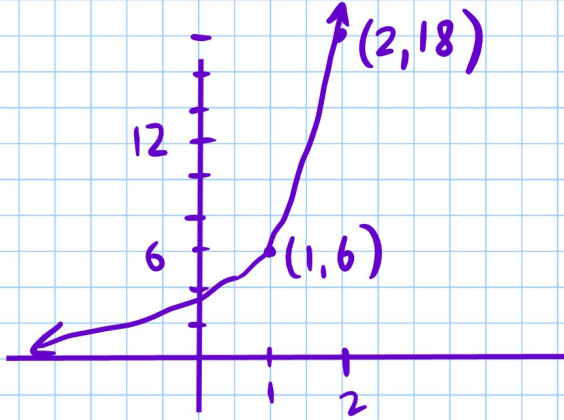
t	Q
0	30
1	26.4
2	23.232

} exp. decay

$$Q = 30 \cdot 0.88^t$$

$\underbrace{1 - 0.88 = 0.12}$

20 p15



$$y = a \cdot b^x$$

$$6 = a \cdot b^1$$

$$18 = a \cdot b^2$$

Divide equations:

$$\frac{ab^2}{ab} = \frac{18}{6}$$

$$b = 3$$

$$y = a \cdot 3^x$$

$$6 = a \cdot 3^1$$

$$6 = 3a$$

$$2 = a$$

$$y = 2 \cdot 3^x$$

p14-16 1-5, 11, 18, 19, 33