The Math Dawg

Introduction to Exponential Growth and Decay

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Exponential Growth/Decay Versus Linear Growth/Decay

LINEAR GROWTH/DECAY IS THE SAME EVERY TIME PERIOD

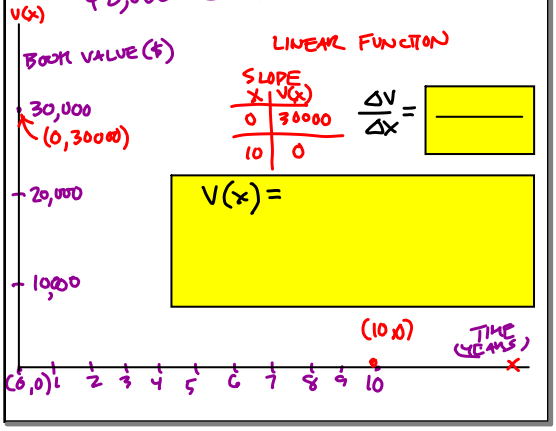
EXAMPLES:

→ HE PAYS $500 PER MONTH

→ HE SAVES $200 PER WEEK.

LINEAR FUNCTIONS HAVE A CONSTANT RATE OF CHANGE. THEY GRAPH AS A STRAIGHT LINE.

EXAMPLE: A CAR WHEN NEW HAS A BOOK VALUE OF $30,000. IT DEPRECIATES AT A RATE OF $3,000 PER YEAR



Exponential Growth/Decay Versus Linear Growth/ Decay

EXPONENTIAL GROWTH/DECAY IS A CONSTANT %. IT IS NOT A CONSTANT RATE.

EXAMPLES:

→ A SAVINGS ACCOUNT GROWS BY 5% PER YEAR ⇒ 100% + 5% = 105% = 1.05

→ A TOWN'S POPULATION IS DECLINING BY 10% PER YEAR ⇒ 100% − 10% = 90% = .9

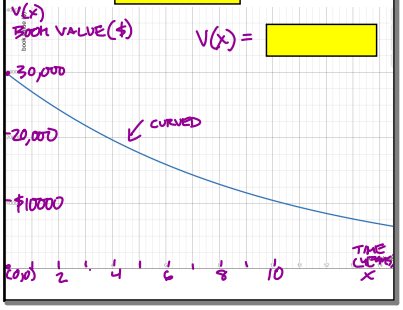
EXPONENTIAL GROWTH DECAY GRAPHS SHOW CURVATURE

EXAMPLE: THE BOOK VALUE OF A CAR IS INITIALLY $30,000. IT DEPRECIATES AT A RATE OF 10% PER YEAR

YEAR	$ BOOK VALUE
0	30000
1	30000(.9)
2	30000(.9)(.9)
3	30000(.9)(.9)(.9)
⋮	
x	

100% − 10% = 90% = .9 ↑ WHAT IS LEFT OVER

V(x) =



Example: Suppose a rabbit population is currently 8 rabbits. It is estimated that it will grow by 30% per year for the next 5 years. Calculate the population rounded to the nearest rabbit. Then on the grid provided sketch a graph of the population. Label your axes.

t (YR)	P(t) #RABBITS
0	
1	
2	
3	
4	
5	
t	

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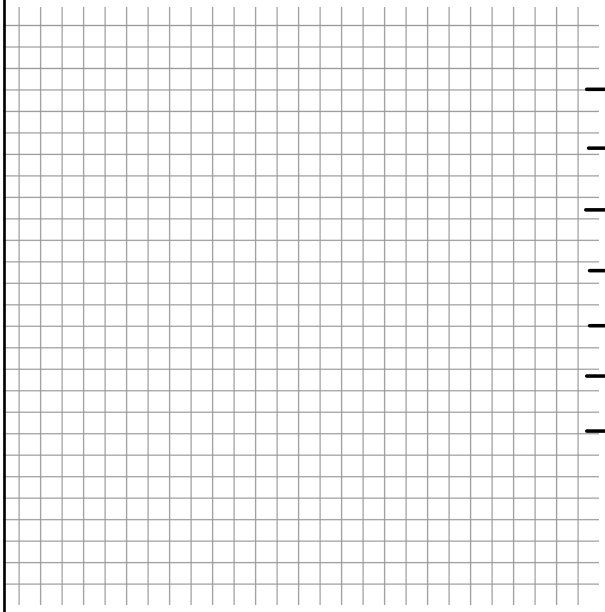
Example: The population of a town is currently 800 people. It is estimated that the population of the town will decline by 20% per year for the next 5 years. Give the projected population of the town to the nearest person after 5 years. Sketch a graph of the population on the grid provided.



t YR	P(t) POP.
0	
1	
2	
3	
4	
5	
t	

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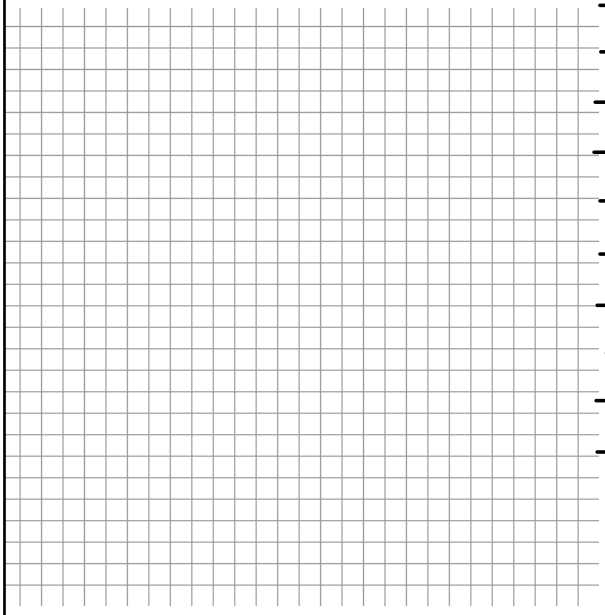
Example: You put $500 in a savings account that has interest compounded annually. If the interest rate is 6.5% per annum how much will you have after 10 years? On the grid provided sketch a graph of the yearly amounts.



t YR	A(t) $
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
t	

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Compound Interest Formula

$$A(t) = P\left(1 + \frac{r}{n}\right)^{nt}$$

WHERE:

t = # OF YEARS

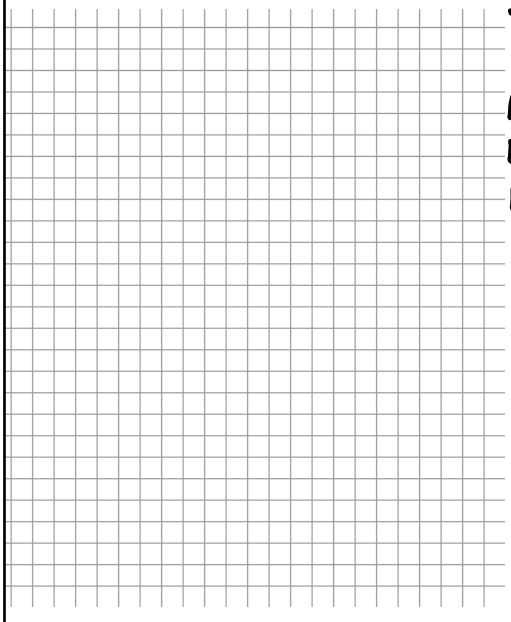
n = # OF COMPOUNDING PERIODS PER ANNUM (YEAR)

r = ANNUAL INTEREST RATE (%)

P = INITIAL AMOUNT ($)

$A(t)$ = AMOUNT IN ACCOUNT AT TIME t (YEARS)

Example: You put $500 in a savings account that has interest compounded quarterly (4 times per year). If the interest rate is 10.75% per annum compounded quarterly how much will you have after 2 years? On the grid provided sketch a graph of the quarterly amounts



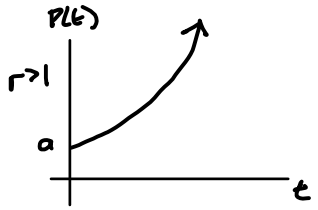
t YR	$A(t)$ $
0	
.25	
.5	
.75	
1	
1.25	
1.5	
1.75	
2	

Did you notice?

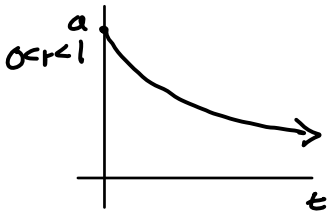
r = GROWTH / DECAY RATE

FOR SOME EXPONENTIAL FUNCTION

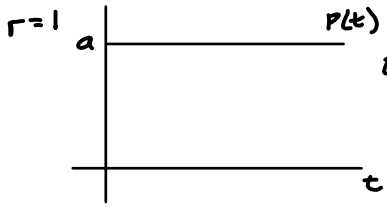
$P(t) = ar^t$



Ex $P(t) = 1000(2)^t$



Ex $P(t) = 1000(.5)^t$



Ex $P(t) = 1000(1)^t$

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