Exponential Graphs

Starter

1. **(Review of last lesson)** Solve the inequality $x^2 + 4x - 5 \leq 0$.

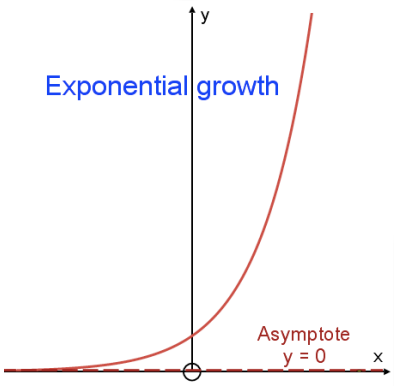
Notes

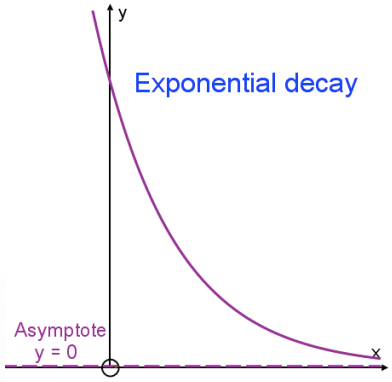
The graphs of exponential growth and decay are below.

General equations

Growth: $y = a^x$ Decay: $y = a^{-x}$

where a is an integer.





The curves are ***asymptotic*** to the $x-$axis, which means the curve gets closer and closer to the curve but ***never*** actually ***touches*** it.

The ***asymptote*** is shown as a ***dotted line*** on the graphs.

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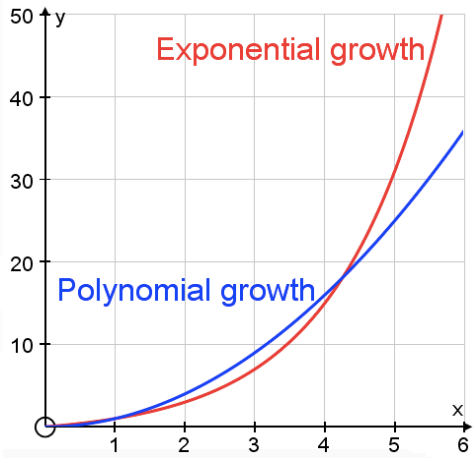
Exponential vs. polynomial growth

From the graph, it can be seen that exponential and polynomial growth are similar at the start, but then exponential growth increase much faster.

This is what scientists were worried about with the Covid-19 outbreak and why the lockdown should have been brought in sooner. At the start, the virus may not have appeared to be growing quickly but scientists knew that the spread of viruses grows exponentially (i.e. it is proportional to the number of people infected).



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E.g. 1 (a) Copy and complete the table of values for $y = 3^x$.

x	−1	−0.5	0	0.5	1	1.5	2	2.5	3
y	0.33								

(b) Draw graph of $y = 3^x$ for $-1 \leq x \leq 3$.

(c) Use your graph to estimate the value of x when:

(i) $y = 7$

(i) $y = 20$

Working: (a)

x	−1	−0.5	0	0.5	1	1.5	2	2.5	3
y	0.33	0.58	1	1.73	3	5.2	9	15.6	27

E.g. 2 (a) By completing the table of values, draw the graph of $y = 3(2^x)$.

x	−1	−0.5	0	0.5	1	1.5	2	2.5	3
y	1.5								

N.B. $y = 3(2^x)$ means find 2^x then multiply by 3 i.e. $y = 3 \times 2^x$

(b) Use your graph to estimate the value of x when:

(i) $y = 11$

(ii) $y = 19$

Link between compound interest and exponentials

The value of a house which is worth £200,000 appreciates by 6% each year $V = 200000 \times 1.06^t$

The value of a car which is worth £15,000 depreciates by 18% each year $V = 15000 \times 0.82^t$

Video: Exponential graphs

Solutions to Starter and E.g.s

Exercise

9-1 class textbook:	p409 E12.11 Qu 1-6, 7-10*
A*-G class textbook:	p366 E12.6 Qu 1-6, 7-8*
9-1 homework book:	p141 E12.6 Qu 1-2, 3-5*
A*-G homework book:	p103 E12.6 Qu 1-4

Summary

Exponential growth: $y = a^x$

Exponential decay: $y = a^{-x}$

Homework book answers (only available during a lockdown)