Week 2
Term 3
2023

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MM2
Exponential Functions and Graphs

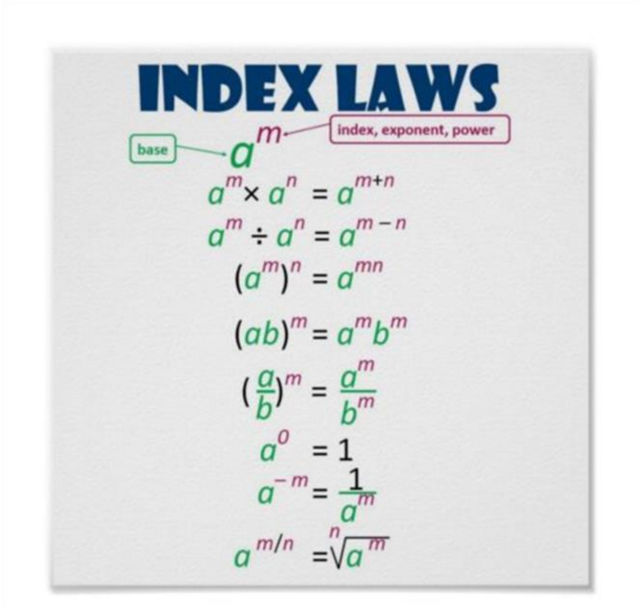
Goals

By the end of this week, you should be able to:

- establish and use the algebraic properties of exponential functions
- recognise the qualitative features of the graph of $y = a^x \ (a > 0)$ including asymptotes, and of its translations ($y = a^x + b \ and \ y = a^{x+c}$)
- identify contexts suitable for modelling by exponential functions and use them to solve practical problems
- solve equations involving exponential functions using technology, and algebraically in simple cases

Theoretical Components

Resources:
Maths Quest 11 Mathematical Methods
Chapter 5 Exponential and Logarithmic Functions (see Google classroom)
Read and make notes:
5C Indicial equations
5D Graphs of exponential equations

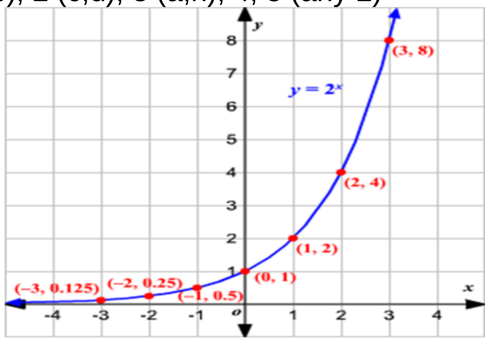


Index_Laws by sorana23

Practical Components

Complete the following from:
Chapter 5 Exponential and Logarithmic Functions (see Google classroom). Organise your solutions neatly in your exercise book.

Ex 5C Indicial equations
Qs 1 – 4 (any 2 from each), 5a, 9b, 10
Ex 5D Graphs of exponential equations
Qs 1 (a,b), 2 (c,d), 3 (a,h), 4, 5 (any 2)



Investigation

See the following page for **Week 2**

Don't forget to start putting together your Journal Entry for Week 1-2!

QFO

Check hawkermaths.com for each week's learning brief as well as GC.

Check-in with your teacher every lesson.

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MM2 Investigation Week 2

We can solve many exponential equations using logarithms. The basic definition of a logarithm is as follows.

$$\text{If } 2^3 = 8, \text{then } \log_2 8 = 3.$$

$$\text{or… if } a^x = b, \text{then } \log_a b = x.$$

Your scientific calculators can use logarithms to solve problems, but the log function has a default base of 10.

We can, for example, solve a problem such as:

$$10^x = 100000$$

$$\log_{10} 100000 = 6$$

But in order to solve problems with different bases, we can use the log law listed below..

The example below illustrates how to solve an indicial equation using logarithms.

WORKED EXAMPLE 22

Solve for x correct to 3 decimal places, if $2^x = 7$.

THINK	WRITE
1 Write the equation.	$2^x = 7$
2 Take $\log_{10}$ of both sides.	$\log_{10}(2^x) = \log_{10}(7)$
3 Use the 'logarithm of a power' law to bring the power, x, to the front of the logarithmic equation.	$x \log_{10}(2) = \log_{10}(7)$
4 Divide both sides by $\log_{10}(2)$ to get x by itself.	Therefore $x = \dfrac{\log_{10}(7)}{\log_{10}(2)}$
5 Evaluate the logarithms correct to 4 decimal places, at least one more than the answer requires.	$x = \dfrac{0.8451}{0.3010}$
6 Solve for x.	$x = 2.808$

Summary: If $b^x = N$, then $x = \dfrac{log_{10}(N)}{log_{10}(b)}$

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Investigation Task

1. The following equations can be solved using indices or logarithms. For each, state whether it can be solved using indices, or must be solved using logarithms, then proceed to solve.

$3^x = 81$	$x^5 = 50$
$3^x = 43$	$6^{2x-1} = 2$
$3^{2x} - 3 = 24$	$16^{\frac{3}{x}} = 10$

2. A frog can jump half the remaining distance of a 10m pond and land on a lily pad with each jump.

   a) Write a table of values for the distance from the end of the pond for each of the frogs first 10 jumps, then decide if the frog will ever be able to reach the end of the pond.

   b) What might the graph of the distance from the end of pond look like? What is the equation of the graph?