Exponential Graphs

Starter

1. **(Review of last lesson)**

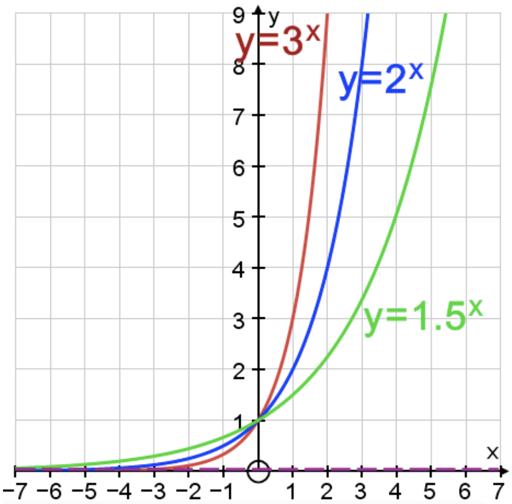
   Solve: (a) $5^{2x} - 6(5^x) - 7 = 0$ (b) $3^{2x+2} - 260(3^x) - 29 = 0$

Notes

Basic exponential graph: $y = a^x$, where $a > 0$

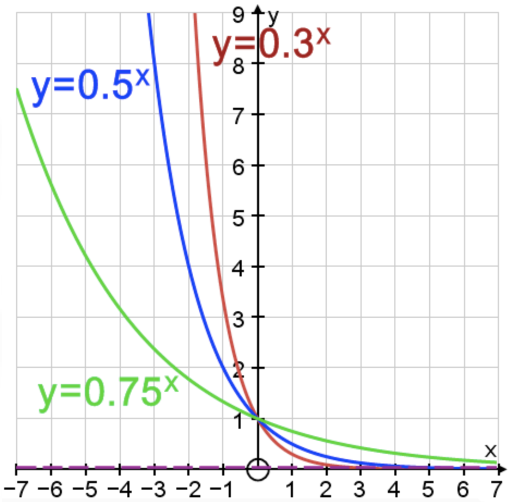
Basic exponential curves are ***asymptotic*** to the x−axis. ***Asymptotes*** are shown by dotted lines.

Exponential growth, $a > 1$



As $x \to -\infty$, $a^x \to 0$

Exponential decay, $0 < a < 1$



As $x \to +\infty$, $a^x \to 0$

Where $a > 1$, the larger the value of a:

- the steeper the curve for $x > 0$
- the quicker the curve gets close to the x−axis for x < 0

N.B. All curves go through (0, 1) because $a^0 = 1$.

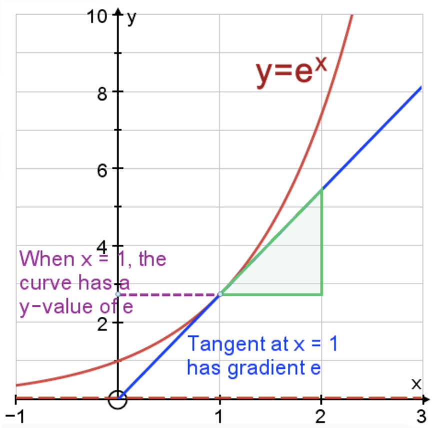
Special case $y = e^x$

The curve $y = e^x$ is very special because the gradient at any point is equal to the y−value at that point

i.e. ***the gradient of the curve*** $y = e^x$ ***is*** e^x

Corollary:

the gradient of the curve $y = e^{kx}$ ***is*** ke^{kx}



E.g. 1 Find the gradient of the curve $y = 2.5e^{6x}$ when:

(a) $x = 5$ (b) $x = \frac{1}{3}$. Leave your answers in exact form.

Working: (a) The gradient of the curve $y = 2.5e^{6x}$ is $6 \times 2.5e^{6x} = 15e^{6x}$

When $x = 5$, the gradient is $15e^{6\times5} = 15e^{30}$

E.g. 2 Find the gradient of the curve $y = 6e^{8x}$ when:

(a) $x = 0$ (b) $x = 4$. Leave your answers in exact form.

Video: Exponential functions

Video: e^x

Solutions to Starter and E.g.s

Exercise

p133 8A Qu 1ac, 2i, 3ac, 4i, 5-10

Summary

Basic exponential graph: $y = a^x$, where $a > 0$

Basic exponential curves are ***asymptotic*** to the $x-$axis and go through (0, 1) because $a^0 = 1$

$y = e^x$: the gradient of the curve $y = e^x$ is e^x

the gradient of the curve $y = e^{kx}$ is ke^{kx}