

Logarithmic and exponential functions



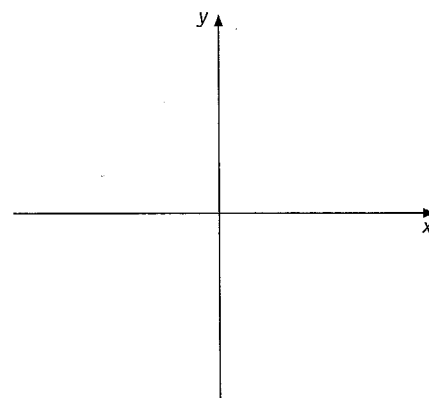
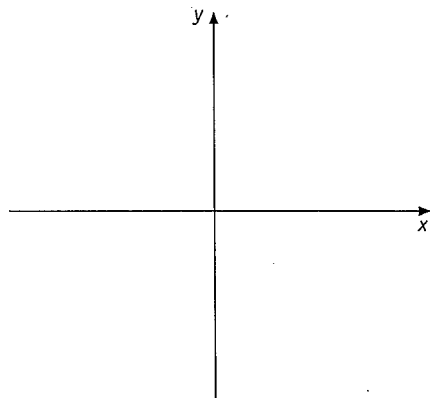
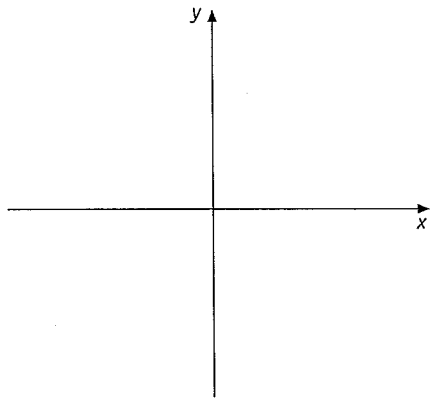
The functions $y = a^x$ and $y = \log_a x$

QUESTION 1 Sketch the graph of:

a $y = 2^x$

b $y = 7^x$

c $y = 3^{-x}$

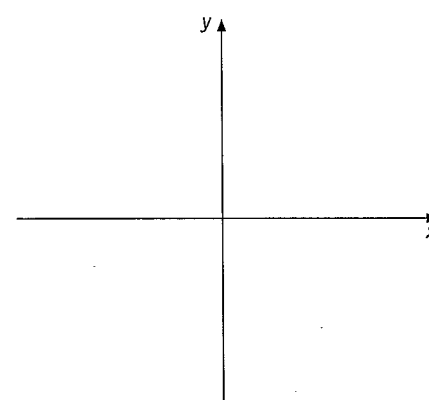
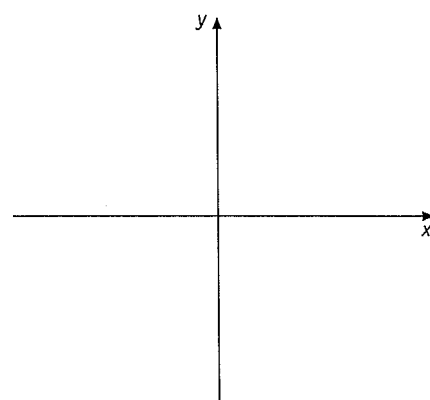
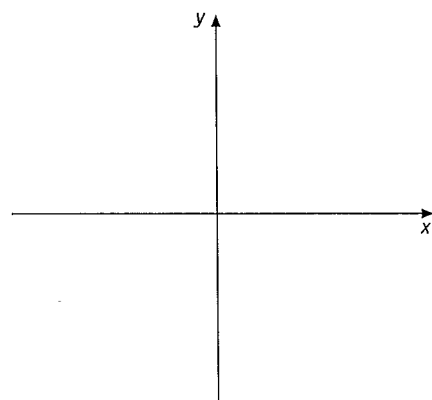


QUESTION 2 Sketch the graph of:

a $y = \log_{10} x$

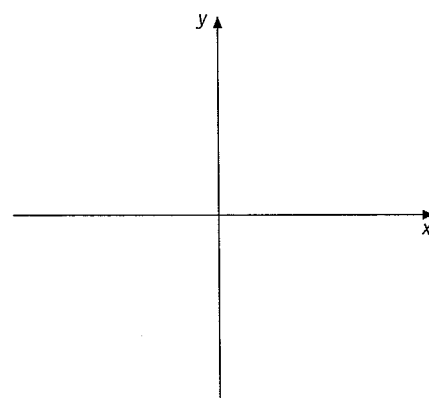
b $y = \log_5 x$

c $y = \log_2 x$



QUESTION 3

a On the same diagram sketch the graph of $y = 3^x$ and $y = \log_3 x$



b Complete: The graph of $y = 3^x$ and $y = \log_3 x$ are reflections of each other in the line _____

Logarithmic and exponential functions

The derivative of $y = a^x$

QUESTION 1 Fill in the blanks in the derivation from first principles of $y = 10^x$

$$\begin{aligned}\frac{dy}{dx} &= \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} \\ &= \lim_{h \rightarrow 0} \frac{\quad}{h} \\ &= \lim_{h \rightarrow 0} \frac{10^x (\quad)}{h} \\ &= 10^x \lim_{h \rightarrow 0} (\quad)\end{aligned}$$

QUESTION 2 Use a calculator to find, to two decimal places, the approximate value of:

a $\lim_{h \rightarrow 0} \left(\frac{10^h - 1}{h} \right)$

b $\lim_{h \rightarrow 0} \left(\frac{2^h - 1}{h} \right)$

c $\lim_{h \rightarrow 0} \left(\frac{3^h - 1}{h} \right)$

QUESTION 3 Find, to two decimal places:

a $\ln 10$

b $\ln 2$

c $\ln 3$

QUESTION 4 Use a calculator to find the value of a , to two decimal places, for which $\lim_{h \rightarrow 0} \left(\frac{a^h - 1}{h} \right) = 1$

QUESTION 5 Using a calculator, find $\lim_{h \rightarrow 0} \left(\frac{e^h - 1}{h} \right)$

QUESTION 6 Write down the derivative of:

a $y = 5^x$

b $y = 7^x$

c $y = 4^x$

d $y = 11^x$

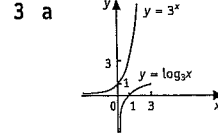
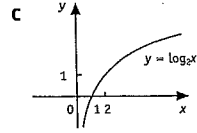
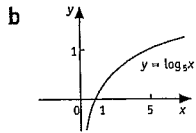
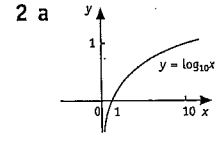
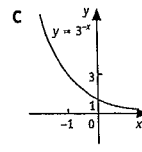
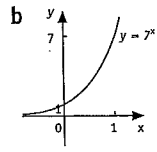
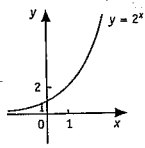
e $y = 6^x$

f $y = 9^x$

g $y = 8^x$

h $y = 15^x$

Page 101 1 a



b $y = x$

Page 102 1 $10^{x+h} - 10^x$, $10^h - 1$, $\frac{10^h - 1}{h}$ 2 a 2.30 b 0.69 c 1.10 3 a 2.30 b 0.69 c 1.10 4 a 2.72 5 1
 6 a $(\ln 5)5^x$ b $(\ln 7)7^x$ c $(\ln 4)4^x$ d $(\ln 11)11^x$ e $(\ln 6)6^x$ f $(\ln 9)9^x$ g $(\ln 8)8^x$ h $(\ln 15)15^x$