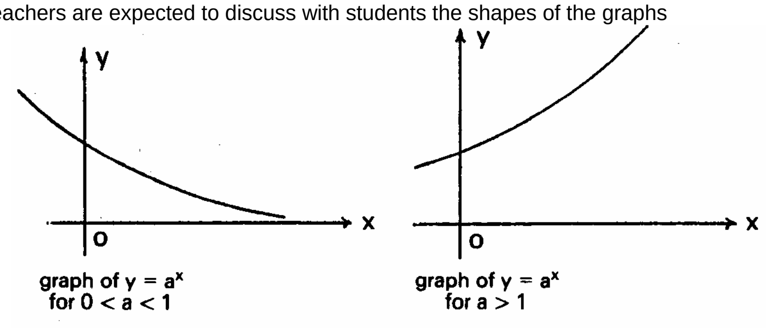
UNIT 3: The Exponential Function

Specific Objectives:

1. To study the properties and graphs of the exponential functions
2. To solve simple equations with unknown indices.
3. To have some knowledge about exponential series.

Detailed Content		Time Ratio	Notes on Teaching
3.1	**Properties and graphs of exponential functions** $f(x)=a^x$ **for $a > 0$, $a \neq 1$**	3	Students may be asked to plot the graph say $y=2^x$ for $-3 \le x \le 5$ .They will have some idea about the general shape of the graph of $y=a^x$ for $a>1$. After this, they should be able to distinguish between the functions $f(x)=x^2$ and $f(x)=2^x$. They are expected to know that (a) $a^x > 0$ for all real values of x; (b) $a^p \cdot a^q = a^{p+q}$; (c) $a^p \div a^q = a^{p-q}$; (d) $(a^p)^q = a^{pq}$ and (e) $a^0 = 1$ Teachers are expected to discuss with students the shapes of the graphs 

Detailed Content		Time Ratio	Notes on Teaching
			The growth of an exponential function $y=a^x$ for $a>1$ resembles approximately that of Investment at compound Interest at constant rate $A(n)=P\left(1+\frac{r}{100}\right)^n$. The growth may be termed Compound Interest Law (C.I.L.). Exponential functions are very Important in science and technology since many phenomena follow the C.I.L. population growth (say that of bacteria) follows this law. There is the law of decay $y=ak^{-bx}$. It describes the fact that a quantity decreases at a rate which is constantly proportional to its magnitude at any given instant. A good example is the exponential decay of radioactive element $N=N_0e^{-\lambda t}$ Teachers may touch upon $\frac{dN}{dt}$, which provides good illustration on the properties of exponential functions, after they have completed differentiation.
3.2	**Solution of simple equations with unknown indices.**	2	Students are expected to know how to solve simple exponential equations, such as 1. $9^x = 27^{x-1}$ 2. $2^{2x} - 5 \cdot 2^x + 4 = 0$
3.3	**The exponential series**	1	The infinite series $e^x = 1+\frac{x}{1!}+\frac{x^2}{2!}+\frac{x^3}{3!}+\cdots+\frac{x^r}{r!}+\cdots$ is called the exponential series. When $x = 1$, $e = 1+\frac{1}{1!}+\frac{1}{2!}+\frac{1}{3!}+\frac{1}{4!}+\cdots \approx 2.71828$. The fact should be made known to students.
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