Exponential Graphs

LI
- Know the Exponential Function and Exponential Graphs.
- Sketch related graphs of exponential functions.

SC
- Graphs of related functions.
The Exponential Graph

For any $a > 0$, the Exponential Function to Base $a$ is the function $y = a^x$.

For any $a > 0$, the Exponential Graph to Base $a$ is the graph of the exponential function $y = a^x$.
Example 1

Sketch the graphs of $y = 4^x$ and $y = (1/5)^x$ on separate diagrams, indicating where each graph crosses the y-axis.

Also indicate the coordinates $(1, p)$ for $y = 4^x$ and $(1, q)$ for $y = (1/5)^x$. 

![Graph of $y = 4^x$](image1)

![Graph of $y = (1/5)^x$](image2)
Example 2

State the equation of the following graph:

\[ y = a^x \]

Substituting the coordinate \((3, 8)\) into the general equation gives,

\[ y = a^x \]

\[ 8 = a^3 \]

\[ \Rightarrow \quad a = 2 \]

\[ \therefore \quad y = 2^x \]
**Example 3**

Sketch the graphs of $y = 2^x$, $y = 2^{(x - 2)}$ and $y = 2^{(x - 2)} + 1$, indicating where all three graphs cross the $y$-axis.

The graph shows three exponential functions with different equations and corresponding points on the graph. The specific points and equations are marked on the graph, helping to illustrate the behavior of each function.
Example 4

The graph of \( y = 2^x \) is shown below.

Sketch the graph of \( y = 2^{(2 \cdot x)} - 8 \), indicating where it crosses the \( x \)- and \( y \)-axes.

The graph of \( y = 2^{(2 \cdot x)} - 8 \) clearly crosses the \( y \)-axis at \((0, -7)\), as it’s the graph of \( y = 2^{(2 \cdot x)} \) shifted 8 units down. To find the \( x \)-intercept, put \( y = 0 \) to get,

\[
0 = 2^{(2 \cdot x)} - 8
\]  
\[
\Rightarrow 2^{(2 \cdot x)} = 8
\]  
\[
\Rightarrow 2 \cdot x = 3
\]  
\[
\Rightarrow x = 3/2
\]
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