An exponential function has a variable in the exponent and a constant base.

If \( a \in \mathbb{R}, \ a > 0 \) and \( a \neq 1 \), then \( y = f(x) = a^x \) is an exponential function with base \( a \).

**Graphs of exponential functions**

**Ex 1:**

\[
y = 2^x
\]

\[
y = 3^x
\]

\[
y = \left(\frac{1}{3}\right)^x + 1
\]

\[
y = e^{2x}
\]

\[
y = -e^x
\]
Ex 2: Label these as either power functions or exponential functions.

a) \( y = 2^x \)  

b) \( y = e^{2x} \)  

c) \( y = -e^x \)  

d) \( y = -x^2 - x^3 \)  

e) \( y = \left( \frac{1}{3} \right)^x + 1 \)

Ex 3: Simplify

a) \( \frac{4^{2-x}}{4^{3x}} \)  

b) \( (2^{3y})^{x-2} \)

Ex 4: If $10,000 is invested for 10 years at 10% interest, compounded continuously, the future value will be $10,000e^{0.10x}$. What will this account be worth in 5 years?