Exponential Functions:

1. **Definition**

$$y = a \cdot b^x$$

where x : input

y : output

a and b are some constants

b is the base of the exponential

conditions for a and b

① $a \neq 0$

② $b > 0$

③ $b \neq 1$

Example :

Exponential

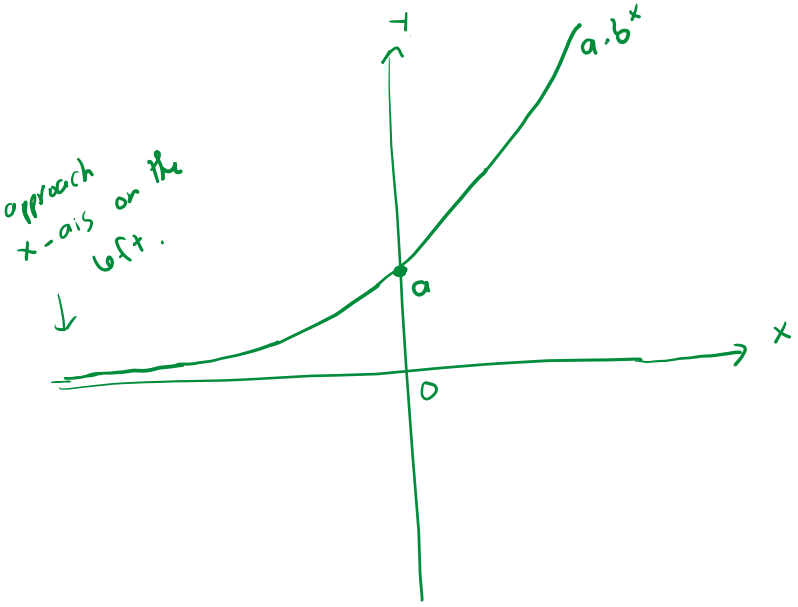
$$\begin{cases} y = 6 \cdot 3^x \\ y = -9 \cdot 4^x \\ y = 2026 \cdot (1/3)^x \end{cases}$$

Not exponential b/c the negative base $\rightarrow$ $y = 8 \cdot (-2)^x$

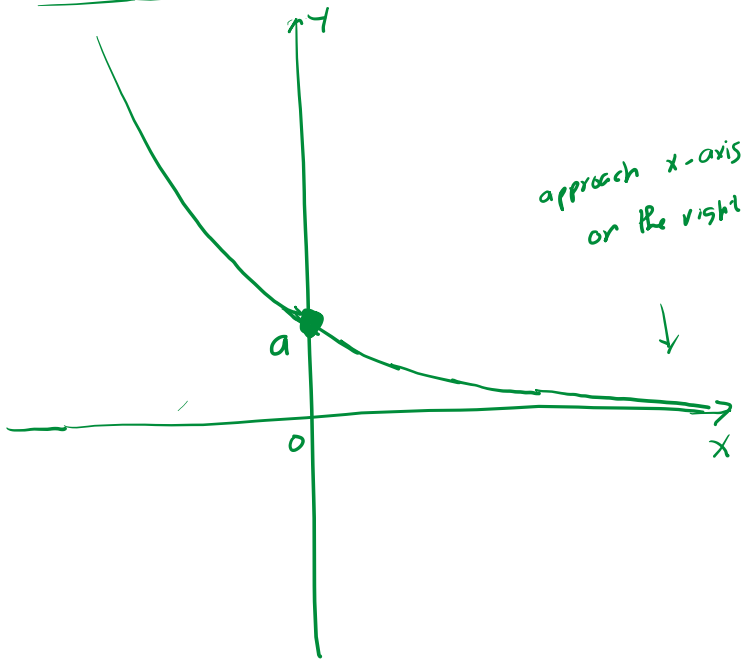
2. Graphs

4 cases.

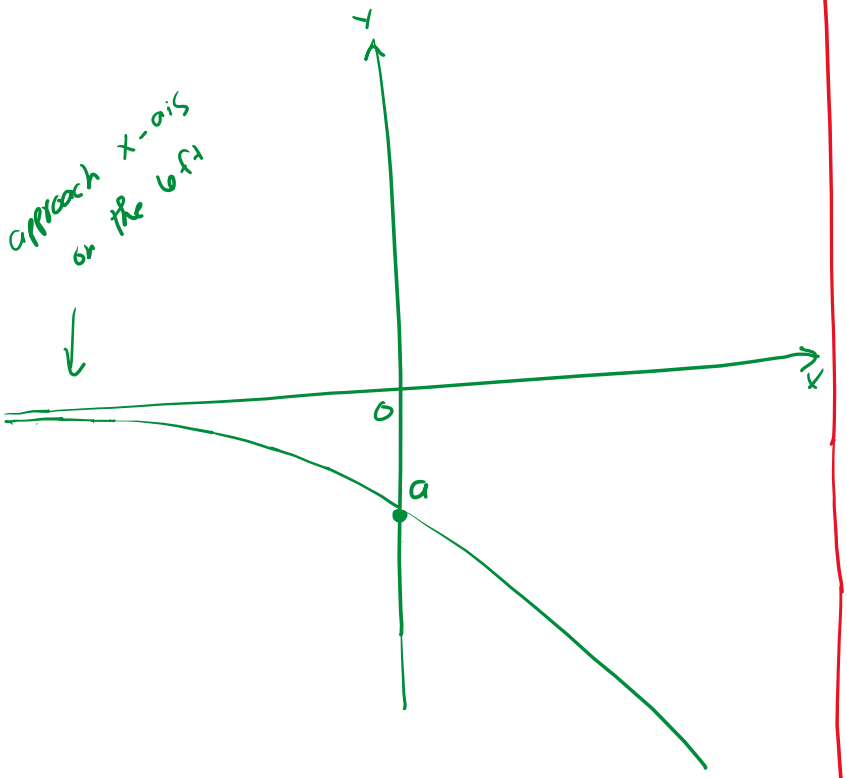
① $a > 0$, $b > 1$



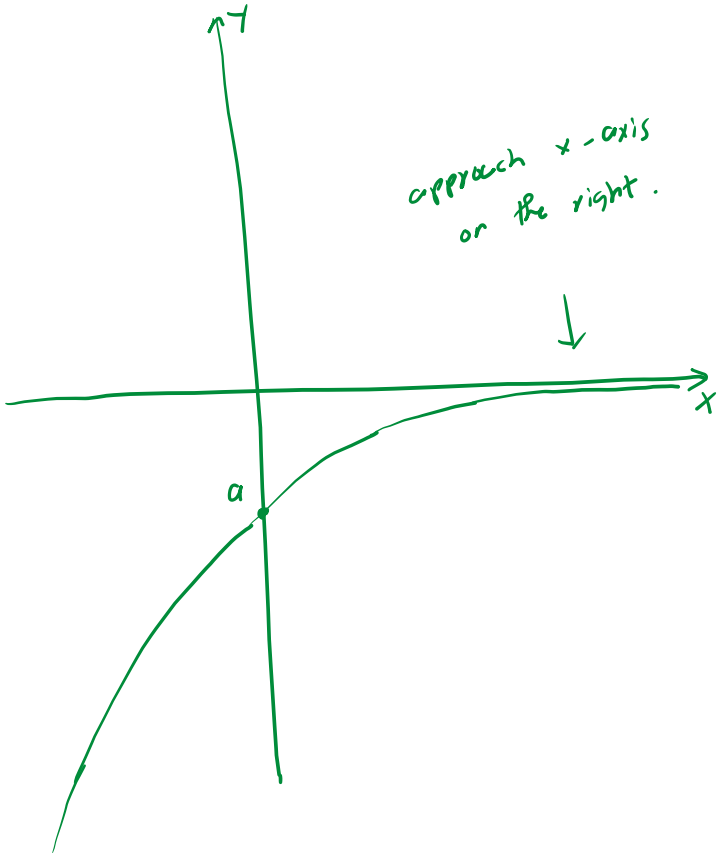
② $a > 0$, $0 < b < 1$



③ $a < 0$, $b > 1$



④ $a < 0$, $0 < b < 1$



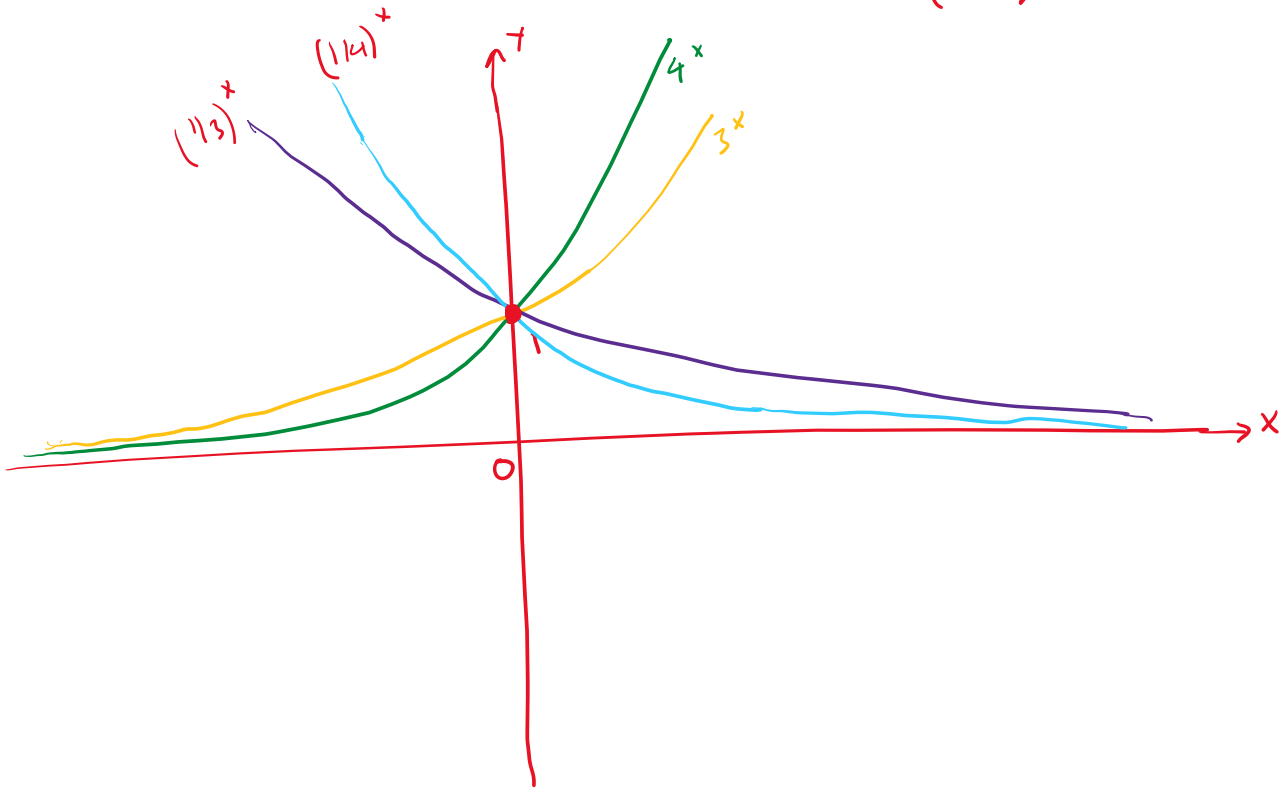
Example: Graph:

① $y = 1 \cdot 3^x$

② $y = 1 \cdot 4^x$

③ $y = 1 \cdot \left(\frac{1}{3}\right)^x$ ←

④ $y = 1 \cdot \left(\frac{1}{4}\right)^x$ ←



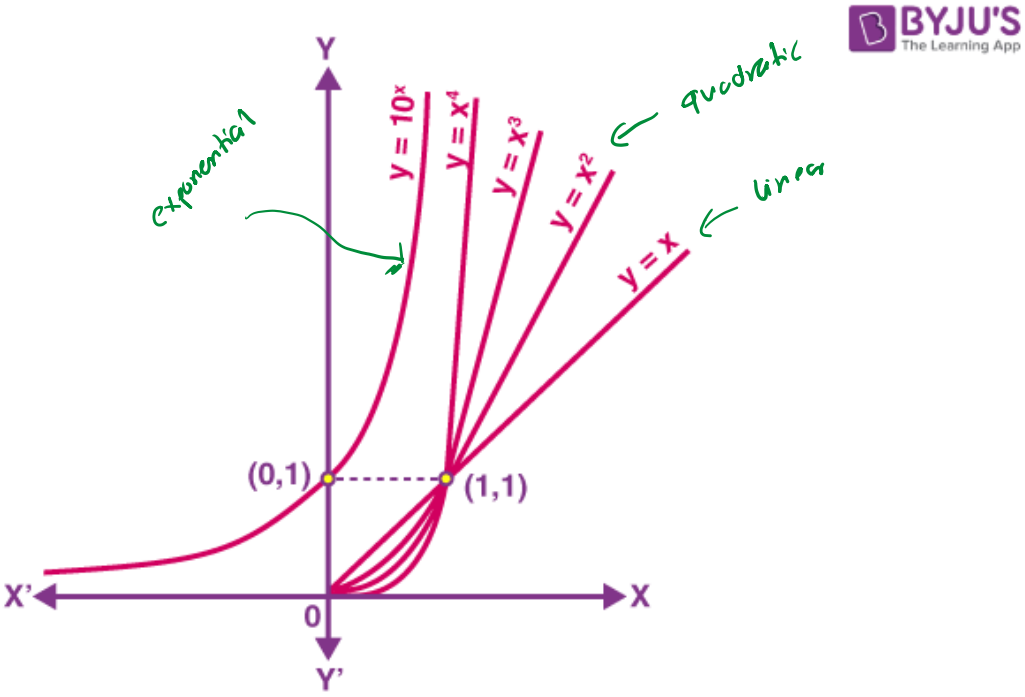
Practice 1.

Graph: ① $y = 2 \cdot 6^x$

② $y = 2 \cdot \left(\frac{1}{3}\right)^x$

Take photos/screenshots of your answers and submit them to Canvas under Assignment_Feb_25.

Note: In the long run, exponential growth is faster than any polynomial/power



3. Paper folding Example

4. Two forms: base e and regular base, b

Mini-Break.

Class will be back in 20-25 minutes.

We will have an assignment at the end of the next session.

4. Solving Exponential Equations.

Log operator/function

How to solve exponential equations using log:

Solving steps:

- Isolate the base
- Take the log of both sides
- Use logarithmic properties to simplify the expression and solve for x
- Round all answers to 4 decimal places

Example:

Solve:

Practice Problem (Assignment_Feb_25)

Solve for x

① $5^{x} = 4$

② $6^{x} = 10$

③ $5 \cdot 7^{x} = 1$

④ $8 \cdot 3^{4x+3} = 2$

⑤ $8^{x+1} = 7^{1-x}$

Take photos/screenshots of your answer and submit it to Canvas (Assignment_Feb_25).