

6M / CLASSROOM LESSON

Exponential graphs

Name: _____ Class: _____ Date: _____

Today you will

- Evaluate exponential rules, including negative inputs.
- Compare growth, decay and practical whole-step choices.

Keep these ideas

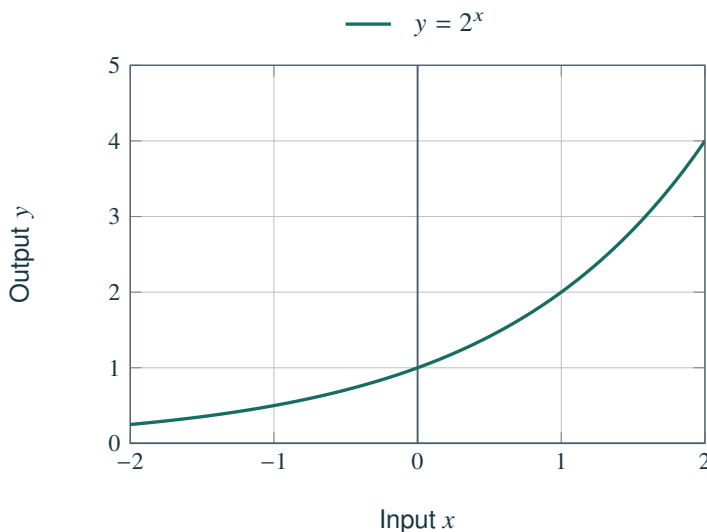
For $y = a^x$, use $a > 0$ and $a \neq 1$. Every such graph passes through $(0, 1)$.

A negative exponent means a reciprocal: $a^{-n} = \frac{1}{a^n}$.

If $a > 1$ the graph grows; if $0 < a < 1$ it decays. Outputs stay positive for every finite input.

Worked example

For $y = 2^x$, find the outputs at $x = -2, 0, 2$ and state the vertical-axis intercept.



1. $2^{-2} = \frac{1}{2^2} = \frac{1}{4}$; $2^0 = 1$; $2^2 = 4$.

2. The vertical axis has input $x = 0$, so the intercept is $(0, 1)$.

Answer

Outputs $\frac{1}{4}, 1, 4$; vertical-axis intercept $(0, 1)$.

The curve used in the worked example.

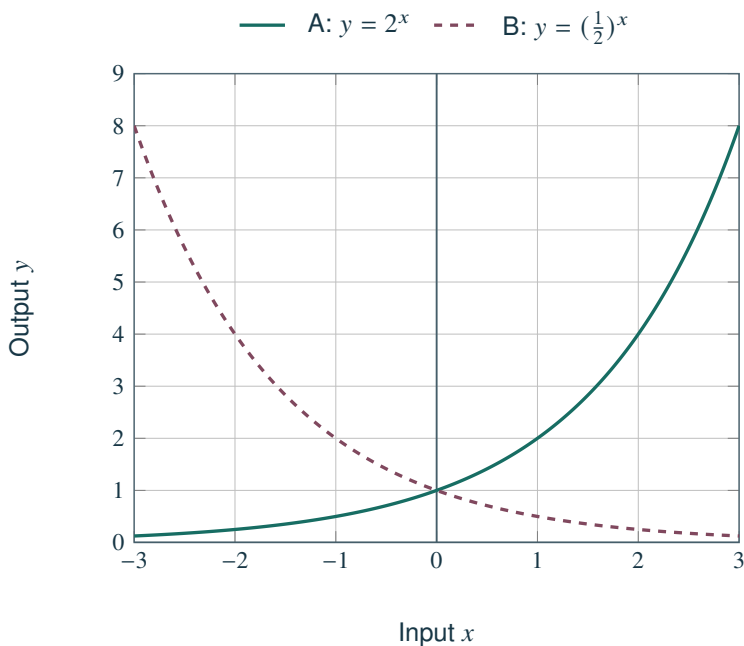
Your turn

1. Evaluate 3^{-2} and 3^0 .

2. Does $y = 0.4^x$ grow or decay? State its vertical-axis intercept.

Apply it on the graph

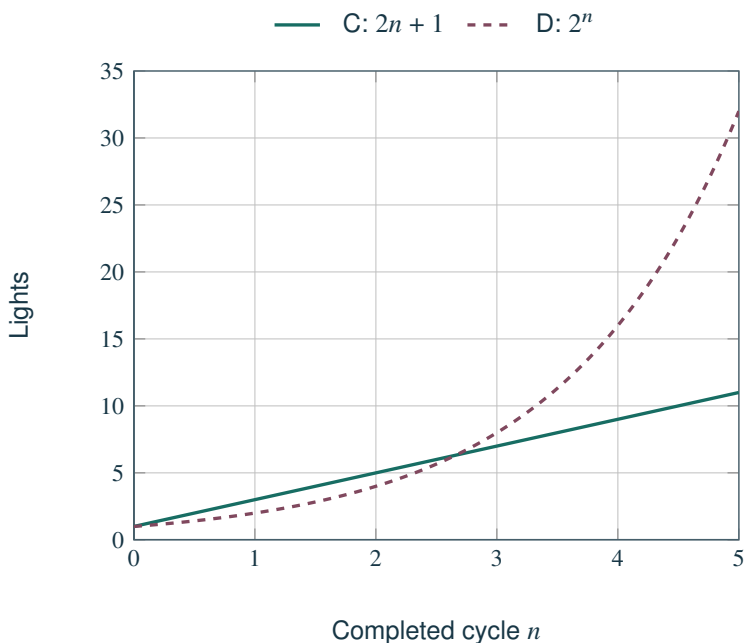
Write your calculations beside each diagram. Label any points or curves you add.



Both curves are supplied. Use this graph for Questions 3 and 4.

3. For curves A and B shown, find both outputs at $x = 2$. State the reflection linking their graphs.

4. Using the same graph, give the shared vertical-axis intercept. Does either curve cross the horizontal axis? Explain.



Plan C adds two lights per cycle; Plan D doubles. Read whole cycles only.

5. For the plans shown, find the first whole cycle with more lights under Plan D than Plan C.

6. Using the same graph, choose the smallest controller for Plan D at cycle 5: 30, 36 or 48 lights. State the final count.