

# Power Function Test Case



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Do the test case for the power function in detail according to the output value and also provide the process in detail utmost detail in both mathematical expression in detail and also in tabular form



To provide a detailed test case for the power function mentioned in your uploaded image, I will break it into a step-by-step explanation along with the corresponding mathematical expressions and results in a tabular format.

## Power Function Code Summary

The function calculates  $y = a \cdot e^{b \cdot x}$ , where:

- $a$ ,  $b$ , and  $x$  are input values.
- $e$  is the base of the natural logarithm (Euler's number, approximately 2.71828).

## Detailed Test Case

Let's use the provided inputs:

- $a = 2$
- $b = 3$
- $x = 1$

## Mathematical Calculation

1. Start with the formula:

$$y = a \cdot e^{b \cdot x}$$

2. Substitute the given values:

$$y = 2 \cdot e^{3 \cdot 1}$$

3. Simplify the exponent:

$$y = 2 \cdot e^3$$

4. Approximate  $e^3$ : Using  $e \approx 2.71828$ ,

$$e^3 = 2.71828^3 = 20.08554$$

5. Compute the result:

$$y = 2 \cdot 20.08554 = 40.17107$$

## Tabular Representation

Step	Expression	Value
Given inputs	$a = 2, b = 3, x = 1$	-
Exponent calculation	$b \cdot x = 3 \cdot 1$	3
Compute $e^3$	$e^3 \approx 2.71828^3$	20.08554
Multiply with $a$	$y = 2 \cdot 20.08554$	40.17107

## Additional Input-Output Example

### Inputs:

- $a = 1.5$
- $b = 2$
- $x = 2$

### Steps:

1. Formula:  $y = a \cdot e^{b \cdot x}$
2. Substitute values:  $y = 1.5 \cdot e^{2 \cdot 2} = 1.5 \cdot e^4$
3. Approximate  $e^4$ :  $2.71828^4 = 54.59815$
4. Compute result:  $y = 1.5 \cdot 54.59815 = 81.89723$

## Tabular Representation

Step	Expression	Value
Given inputs	$a = 1.5, b = 2, x = 2$	-
Exponent calculation	$b \cdot x = 2 \cdot 2$	4
Compute $e^4$	$e^4 \approx 2.71828^4$	54.59815
Multiply with $a$	$y = 1.5 \cdot 54.59815$	81.89723

## Conclusion

This process ensures each step of the calculation is clear and verifiable. The output matches the expected values when the calculations are performed correctly using the power function formula. Let me know if you need further examples or clarification!



a bit more in detail



Let's dive even deeper into the detailed step-by-step process for the **power function**  $y = a \cdot e^{b \cdot x}$ . I'll cover **every single substep** with **mathematical explanations**, showing how each component is derived.

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**Test Case: Inputs**  $a = 2, b = 3, x = 1$

### 1. Start with the Formula

The general formula is:

$$y = a \cdot e^{b \cdot x}$$

Here:

- $a = 2$  (multiplier for the exponential term),
  - $b = 3$  (controls the growth rate),
  - $x = 1$  (independent variable),
  - $e \approx 2.71828$  (Euler's constant).
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### 2. Calculate the Exponent

The term  $b \cdot x$  needs to be evaluated first:

$$b \cdot x = 3 \cdot 1 = 3$$

This gives us:

$$y = 2 \cdot e^3$$

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### 3. Compute $e^3$

Next, calculate  $e^3$ . Euler's constant ( $e$ ) raised to the power 3 can be calculated as:

$$e^3 = 2.71828 \cdot 2.71828 \cdot 2.71828$$

Let's break this into smaller steps:

1. First multiplication:

$$2.71828 \cdot 2.71828 = 7.38905$$

2. Multiply the result by  $e$  again:

$$7.38905 \cdot 2.71828 = 20.08554$$

Thus:

$$e^3 = 20.08554$$

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#### 4. Multiply by $a$

Now substitute  $e^3$  into the formula:

$$y = 2 \cdot 20.08554$$

Multiply:

$$2 \cdot 20.08554 = 40.17107$$

So:

$$y = 40.17107$$

#### Tabular Representation for Each Step

Step	Expression	Intermediate Value
Input values	$a = 2, b = 3, x = 1$	-
Calculate $b \cdot x$	$b \cdot x = 3 \cdot 1$	3
Approximate $e$	$e \approx 2.71828$	$e = 2.71828$
Compute $e^3$	$2.71828^3 = 20.08554$	20.08554
Multiply with $a$	$2 \cdot 20.08554 = 40.17107$	40.17107

#### Breakdown of Intermediate Steps for Exponent $e^3$

To help visualize  $e^3 = 2.71828^3$ , let's compute it in smaller parts.

1. Compute  $2.71828^2$  (square of  $e$ ):

$$2.71828 \cdot 2.71828 = 7.38905$$

2. Multiply the square by  $e$  again to get  $e^3$ :

$$7.38905 \cdot 2.71828 = 20.08554$$

#### Additional Example for Clarity

Inputs:

- $a = 1.5$ ,
- $b = 2$ ,
- $x = 2$ .

Steps:

1. Formula:

$$y = a \cdot e^{b \cdot x}$$

2. Substitute values:

$$y = 1.5 \cdot e^{2 \cdot 2}$$

3. Calculate the exponent:

$$b \cdot x = 2 \cdot 2 = 4$$

4. Compute  $e^4$ :

$$e^4 = 2.71828^4 = 2.71828 \cdot 2.71828 \cdot 2.71828 \cdot 2.71828$$

Intermediate steps:

- $2.71828^2 = 7.38905$ ,
- $7.38905 \cdot 2.71828 = 20.08554$ ,
- $20.08554 \cdot 2.71828 = 54.59815$ .

Thus:

$$e^4 = 54.59815$$

5. Multiply by  $a$ :

$$y = 1.5 \cdot 54.59815 = 81.89723$$

## Tabular Representation for Example 2

Step	Expression	Intermediate Value
Input values	$a = 1.5, b = 2, x = 2$	-
Calculate $b \cdot x$	$b \cdot x = 2 \cdot 2$	4
Approximate $e$	$e \approx 2.71828$	$e = 2.71828$
Compute $e^4$	$2.71828^4 = 54.59815$	54.59815
Multiply with $a$	$1.5 \cdot 54.59815 = 81.89723$	81.89723

## Conclusion

These examples show detailed computations for the power function in both mathematical and tabular forms. Each step, including exponent calculations and intermediate results, has been explained in full. Let me know if you'd like further elaboration!