**Function Analysis and Plotting Code**

This Python script analyzes and plots mathematical functions using SymPy, NumPy, and Matplotlib.

**Libraries Used**

* **SymPy**: For symbolic mathematics.
* **Matplotlib**: For visualizations.
* **NumPy**: For numerical computations.

**Key Components**

**Analyze Function**

This function analyzes the input mathematical function:

1. **Domain**: Where the function is continuous.
2. **Intercepts**:
   * X Intercepts: Where the function crosses the x-axis.
   * Y Intercept: Where the function crosses the y-axis.
3. **Derivatives**:
   * First Derivative: Finds critical points and intervals of increase/decrease.
   * Second Derivative: Analyzes concavity and convexity.
4. **Maxima and Minima**: Identifies local maxima and minima.
5. **Vertical Asymptotes**: Points where the function approaches infinity.
6. **Horizontal Asymptotes**: Lines the graph approaches as x approaches infinity.
7. **Intervals**:
   * Increasing/Decreasing: Where the function rises or falls.
   * Concave/Convex: Intervals of concavity and convexity.

Results are returned as a dictionary.

**Plot Function**

This function plots the mathematical function:

* Uses np.linspace for x-values.
* Evaluates the function with sp.lambdify.
* Includes reference axes and grid lines.

**User Interaction**

* **Input**: Enter a mathematical expression as a function of x.
* **Output**:
  + Analytical results: domain, intercepts, asymptotes, and intervals.
  + A plot of the function from -10 to 10.

**Example**

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Enter the function you want to analyze: x\*\*2 - 4

* **Output**:
  + Domain: All real numbers
  + X Intercepts: [-2, 2]
  + Y Intercept: -4
  + Maxima and Minima: Details provided
  + Vertical Asymptotes: None
  + Horizontal Asymptotes: None
  + Increasing Intervals: Details provided
  + Decreasing Intervals: Details provided
  + Concave Intervals: Details provided
  + Convex Intervals: Details provided
* **Plot**: A parabolic curve for y=x2−4y = x^2 - 4y=x2−4.

**Notes**

* Use Python's syntax for input functions.
* Adjust plot range via np.linspace(-10, 10, 400) in plot\_function.