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Limits of Functions: X tends to Infinity

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Abstract: ***In this unit, we explain what it means when a function tends to infinity, at least infinity, or to a true bond, while x tends to infinity or infinity. We also explain what it means that a function tends to be real, while x tends to a certain real number. In any case, we provide an example of a function that does not reach a limit. To master the techniques described here, it is important that you do many exercises to make it second nature. In this example, we use Python programming to check the limit when x goes to infinity.In mathematics, a limit is a value that a function (or sequence) "approaches" as the input (or index) "approaches" some value. Limits are essential to calculus (and mathematical analysis in general) and are used to define continuity, derivatives, and integrals. In this article various python libraries used.***

Keywords: numpy, sympy, pycharm, python, Programming Language

1. Sympy Introduction

SymPy is a Python library for symbolic calculations. It offers computational functions as a stand-alone application, as a library for other applications or as SymPy Live or SymPy Gamma on the web. SymPy is easy to install and verify because it is written entirely in Python with some dependencies. This simple access, combined with a simple and extensible code base in a trusted language, makes SymPy an algebraic calculation system with a relatively small entry threshold.

SymPy includes functions that range from basic symbolic arithmetic to calculus, algebra, discrete mathematics and quantum physics. The result of the calculations can be formatted in the LaTeX code.

2. The limit of a function as x tends to infinity

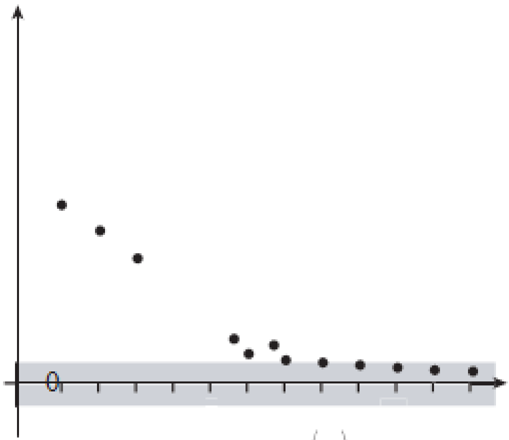
If we have a sequence *(n=1)*, means for the sequence to have a limit $(y_n)^{\infty}$, we can say what it as *n* tends to infinity. We write

$$y_n \to l \quad \text{as} \quad n \to \infty$$

if, however small a distance we choose, y_n eventually gets closer to *l* than that distance, and stays closer. We can also write

$$\lim_{x\to\infty} f(x) = l \,.$$

For example, consider the sequence where yn = 1/n. The numbers in this sequence get closer and closer to zero. Whatever positive number we choose, y_n will eventually become smaller than that number, and stay smaller. So y_n eventually gets closer to zero than any distance we choose, and stays closer. We say that the sequence has limit zero as *n* tends to infinity.



the sequence $\left(\frac{}{n}\right)_{n=1}$

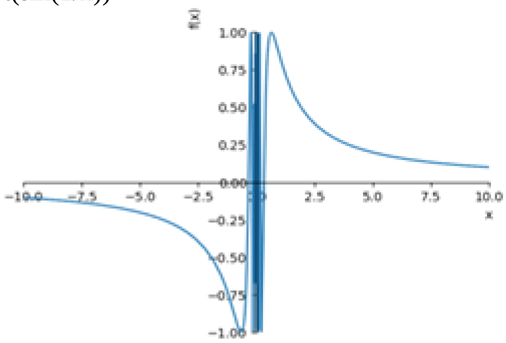
Check the limit of the following equations when x tends to infinity.

3. Related Work

K.R. Srinath [2] in this article introduced the features of Python programming. This article also discusses the reasons for the recent recognition of Python as the fastest-growing programming language, supported by research on articles from various magazines and well-known websites. Python is a language suitable for both learning and programming in the real world. This document describes the main features of the Python language, as well as the types of programming supported by Python, its users, and its applications. Xing Cai [6] This article discusses the performance of scientific applications using the Python programming language. As a first step, let's look at several techniques to improve the efficiency of the Python serial code computer. It discussed the basic programming techniques of Python for the parallelization of serial scientific applications. It has been shown that effective implementation of matrix-related operations is essential for achieving good performance in parallel, as in the case of a series. Once bay operations are implemented effectively, probably using a multilingual implementation, good serial and parallel performance could be achieved. This is confirmed by a series of digital experiments. It also shows that Python is suitable for writing high-level parallel programs.
Example:

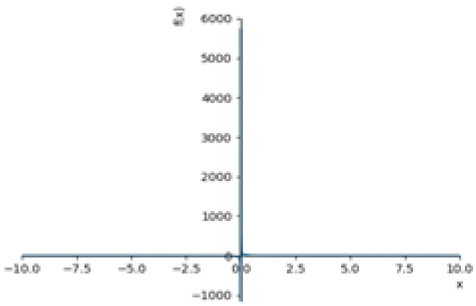
1) Discuss the limit of following function f(x) = sin(1/x) when x tends to infinity.

```
import numpy as np
from sympy import *
x = symbols('x')
init_printing(use_unicode = True
print(limit (sin(1/x),x,oo,'+'))
plot(sin(1/x))
```



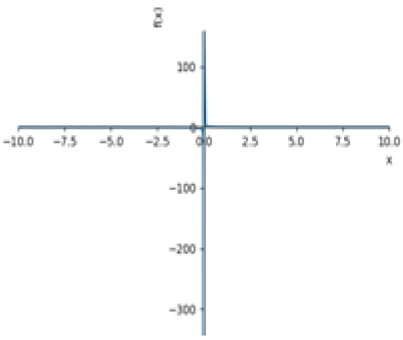
2) Discuss the limit of following function f(x) = e/x when x tends to infinity.

```
import numpy as np
from sympy import *
x = symbols('x')
init_printing(use_unicode = True)
print(limit (exp(1)/x,x,oo,'+'))
plot (exp(1)/x)
```



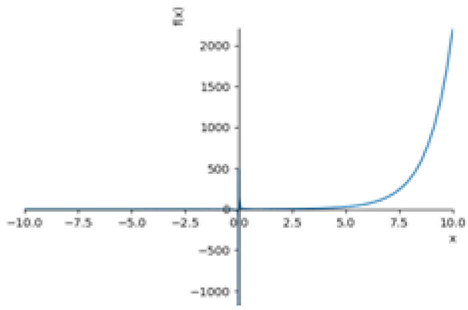
3) Discuss the limit of following function f(x) = e^{-1}/x when x tends to infinity.

```
import numpy as np
from sympy import *
x = symbols('x)
init_printing(use_unicode = True
print(limit (exp(-1)/x,x,oo)
plot(exp(-1)/x)
```



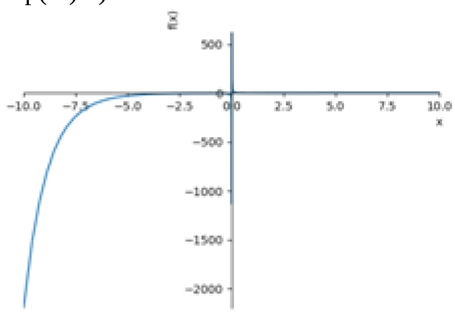
4) Discuss the limit of following function f(x) = e^{x}/x when x tends to infinity.

```
import numpy as np
from sympy import *
x = symbols('x')
init_printing(use_unicode = True)
print(limit (exp(x)/x,x,oo))
plot(exp(x)/x)
```



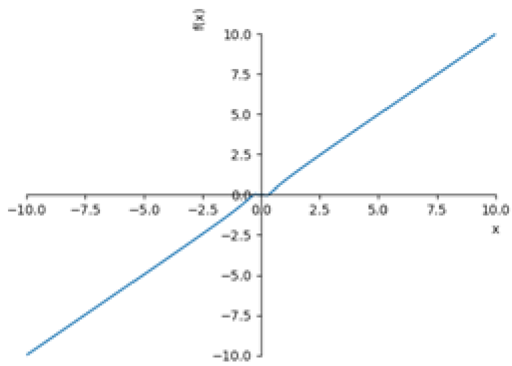
5) Discuss the limit of following function f(x) = e-^{x}/x when x tends to infinity.

```
import numpy as np
from sympy import *
x = symbols('x')
init_printing(use_unicode = True)
print(limit (exp(-x)/x,x,oo))
plot(exp(-x)/x)
```



6) Discuss the limit of following function f(x) = x^{2}sin(1/x) when x tends to infinity.

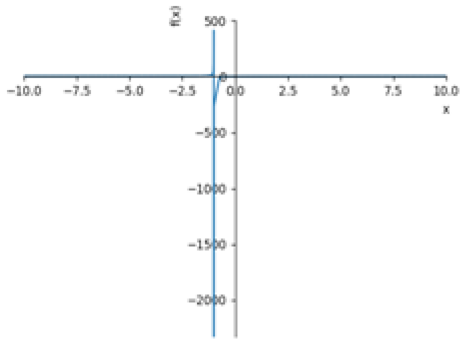
```
import numpy as np
from sympy import *
x = symbols('x')
init_printing(use_unicode = True)
print(limit (x**2*sin(1/x),x,oo,'+')
plot(x**2*sin(1/x))
```



7) Discuss the limit of following function f(x) = x / (1+x) when x tends to infinity.

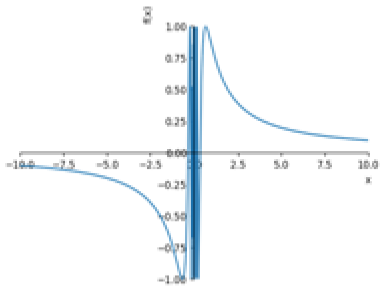
```
import numpy as np
from sympy import *
x = symbols('x')
```

```
init_printing(use_unicode = True)
print(limit (x/(1+x),x,oo,'+'))
plot(x/(1+x))
```



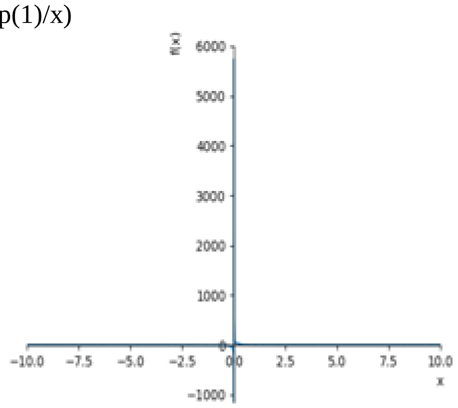
8) Discuss the limit of following function f(x) = sin(1/x) when x tends to infinity.

```
import numpy as np
from sympy import *
x = symbols('x')
init_printing(use_unicode = True)
print(limit (sin(1/x),x,oo,'+'))
plot(sin(1/x))
```



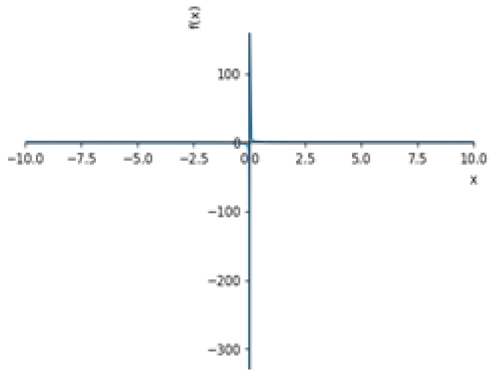
9) Discuss the limit of following function f(x) = e/x when x tends to infinity.

```
import numpy as np
from sympy import *
x = symbols('x')
init_printing(use_unicode = True)
print(limit (exp(1)/x,x,oo,'+'))
plot(exp(1)/x)
```



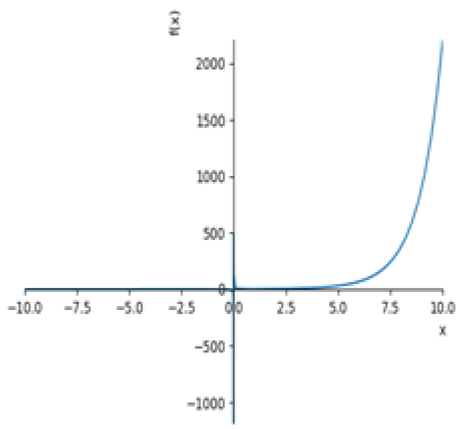
10) Discuss the limit of following function f(x) = e^{-1}/x when x tends to infinity.

```
import numpy as np
from sympy import *
x = symbols('x')
init_printing(use_unicode = True)
print(limit (exp(-1)/x,x,oo))
plot(exp(-1)/x)
```



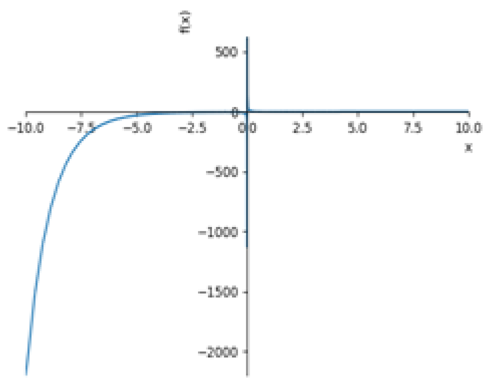
11) Discuss the limit of following function f(x) = e^{x}/x when x tends to infinity.

```
import numpy as np
from sympy import *
x = symbols('x')
init_printing(use_unicode = True)
print(limit (exp(x)/x,x,oo))
plot(exp(x)/x)
```



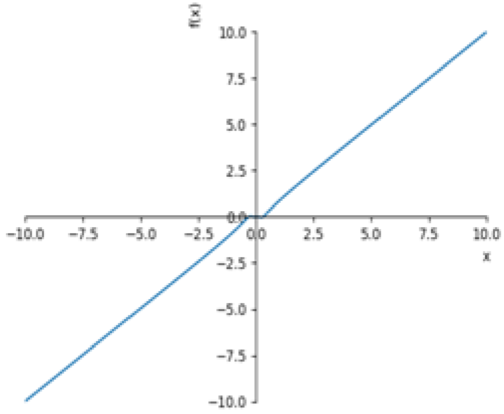
12) Discuss the limit of following function f(x) = e^{-x}/x when x tends to infinity.

```
import numpy as np
from sympy import *
x = symbols('x')
init_printing(use_unicode = True)
print(limit (exp(-x)/x,x,oo))
plot(exp(-x)/x)
```



13)Discuss the limit of following function $f(x) = x^2\sin(1/x)$ when x tends to infinity.

```
import numpy as np
from sympy import *
x = symbols('x')
init_printing(use_unicode = True)
print(limit (x**2*sin(1/x),x,oo,'+'))
plot(x**2*sin(1/x)
```



4. Results and Discussion

In this article, implement equations in Python using Python libraries and draw the diagram of the specified equation. The notion of a boundary of a sequence is even more generalized to the notion of the limit of a topological network and is closely related to the limit and the direct limit in the theory of categories. The limits to infinity are not really difficult once you've known them, but at first, they may seem a little dark. The basic principle for infinite limits is that many functions come close to a certain value as their independent variable increases or decreases. In the future, try to implement more mathematical equations in Python, including calculation.

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