Limits

We can find limits of functions in SymPy by creating objects of the Limit class as follows

In [15]:
```
#  S, which is a special SymPy class that contains the definition of infinity (pc
from sympy import Limit, Symbol, S
x = Symbol('x')
m = Limit(1/x, x, S.Infinity)
m
```

Out[15]: $\lim_{x \to \infty} \frac{1}{x}$

In [16]:
```
#To find the value of the limit, we use the doit() method
# doit method is used to evaluate the function which is not evaluated by default
m.doit()
```

Out[16]: 0

3.The prominent mathematician James Bernoulli discovered that as the value of n increases, the term $(1 + 1/n)^n$ approaches the value of e—the constant that we can verify by finding the limit of the function:

In [37]:
```
from sympy import Limit, Symbol, S
n = Symbol('n')
Limit((1+1/n)**n, n, S.Infinity).doit()
```

Out[37]: e

In [1]:
```
from cmath import *
from math import *
from sympy import *
#SymPy is a Python library for symbolic mathematics.
x,y,z = symbols("x,y,z")
```

4.Find $lim_{x-->2} x^2 + 2$

In [2]:
```
limit(x**2+2,x,2)
```

Out[2]: 6

5. Find $lim_{x-->1} x^2 + 2$

In [3]:
```
limit((x**2)+2,x,1)
```

Out[3]: 3

To determine value from LHS and RHS

1) $f(x) = x^2 + 2x + 1$

In [12]:
```
import numpy as np
def limit():
    n=float(input("Enter the value of limit point: "))
    print("z tends to n from left hand side")
    l=np.linspace(n-0.1,n,10)
    f1=l**2+2*l+1
    print(f1)
    print("z tends to n from right hand side")
    m=np.linspace(n,n+0.1,10)
    f2=m**2+2*m+1
    print(f2[::-1])
    print("z at n")
    f3=n**2+2*n+1
    print(f3)
```

In [13]:
```
limit()
```

```
Enter the value of limit point: 5
z tends to n from left hand side
[34.81       34.94123457 35.07271605 35.20444444 35.33641975 35.46864198
 35.60111111 35.73382716 35.86679012 36.        ]
z tends to n from right hand side
[37.21       37.0745679  36.93938272 36.80444444 36.66975309 36.53530864
 36.40111111 36.26716049 36.13345679 36.        ]
z at n
36.0
```

2) $f(x) = 2x + 4$

In [14]:
```
def limit():
    n=float(input("Enter the value of limit point: "))
    print("z tends to n from left hand side")
    l=np.linspace(n-0.1,n,10)
    f1= 2*l + 4
    print(f1)
    print("z tends to n from right hand side")
    m=np.linspace(n,n+0.1,10)
    f2= 2*m + 4
    print(f2[::-1])
    print("z at n")
    f3= 2 *n +4
    print(f3)
```

In [15]:
```
limit()
```

```
Enter the value of limit point: 4
z tends to n from left hand side
[11.8        11.82222222 11.84444444 11.86666667 11.88888889 11.91111111
 11.93333333 11.95555556 11.97777778 12.        ]
z tends to n from right hand side
[12.2        12.17777778 12.15555556 12.13333333 12.11111111 12.08888889
 12.06666667 12.04444444 12.02222222 12.        ]
z at n
12.0
```

In [ ]:
```
```