

```
In [80]: import sympy as sp
import math
```

```
In [81]: x = sp.Symbol('x')
```

```
In [82]: f = sp.Function('f')
```

```
In [83]: f = sp.ln(x) + 12*x + 1
```

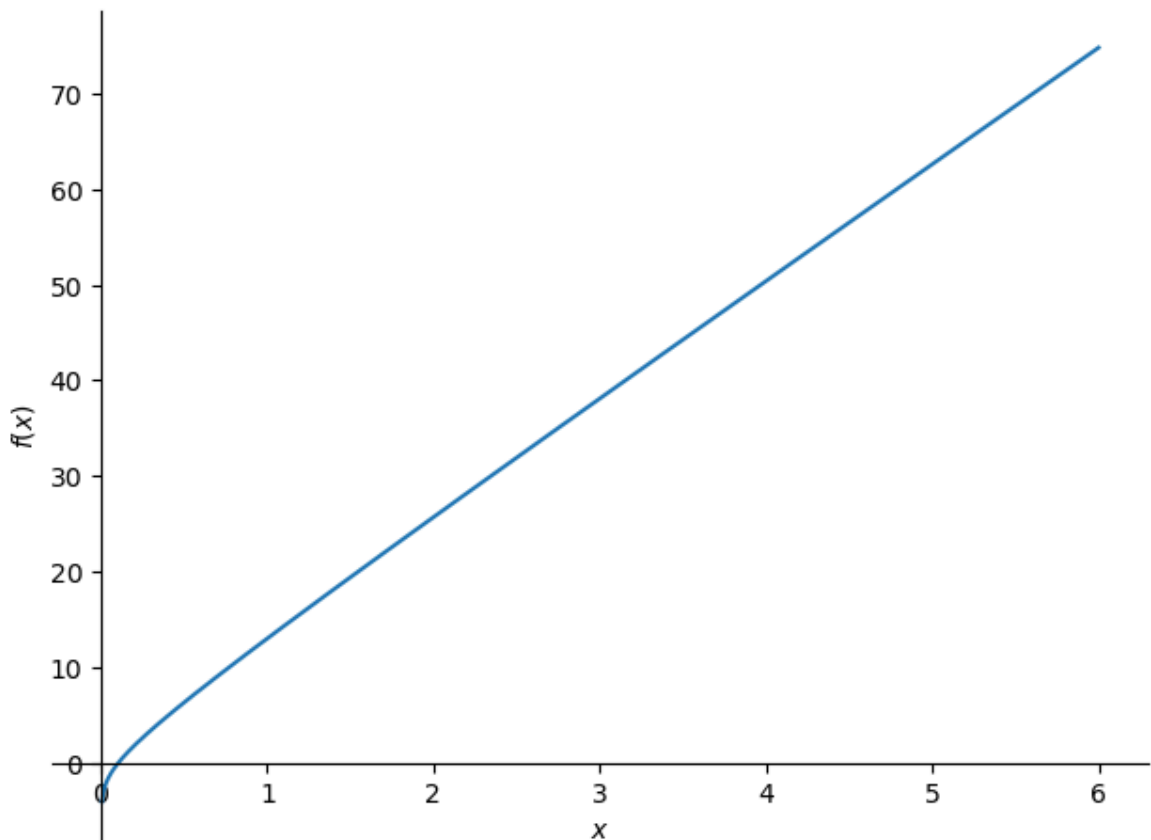
```
In [84]: display(f)
```

$$12x + \log(\left(x\right)) + 1$$

```
In [89]: display(r'la courbe de f pour x = ]0,6]')
sp.plot(f,(x,0,6))
```

'la courbe de f pour x =]0,6]'

<lamdbifygenerated-29>:2: RuntimeWarning: divide by zero encountered in log
return 12*x + log(x) + 1

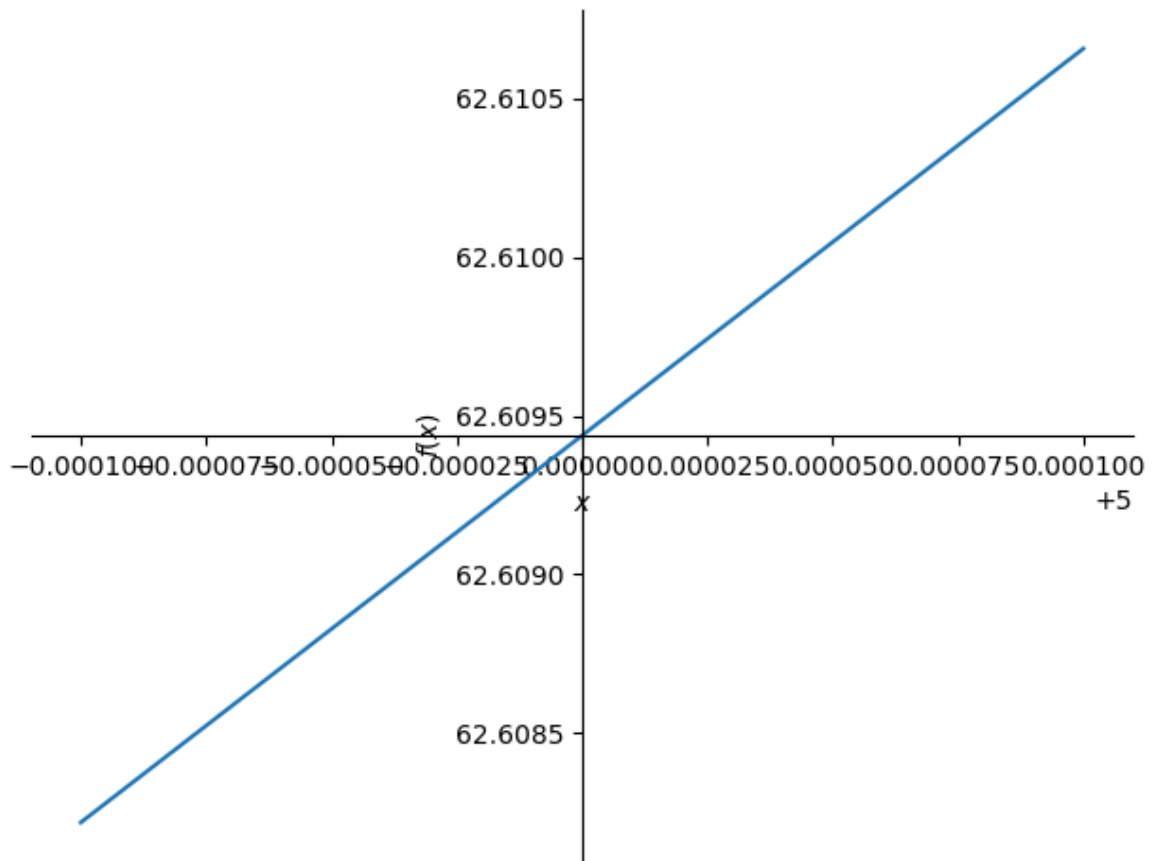


```
Out[89]: <sympy.plotting.backends.matplotlibbackend.matplotlib.MatplotlibBackend at 0x20e554be8d0>
```

```
In [90]: display(r'la courbe de f pour x = [4.9999,5.0001]')
```

'la courbe de f pour x = [4.9999,5.0001]'

```
In [91]: sp.plot(f,(x,4.9999,5.0001))
```



Out[91]: <sympy.plotting.backends.matplotlibbackend.matplotlib.MatplotlibBackend at 0x20e55763650>

```
In [92]: Vgauche = [4.9999, 4.99999, 4.999999]
Vdroite = [5.000001, 5.00001, 5.0001]
print('Limite à gauche')
Ugauche = [f.subs(x,i) for i in Vgauche]
print(Vgauche)
print(Ugauche)
```

```
Limite à gauche
[4.9999, 4.99999, 4.999999]
[62.6082179122341, 62.6093159124321, 62.6094257124341]
```

```
In [93]: print('limite à droite')
Udroite = [f.subs(x,i) for i in Vdroite]
print(Vdroite)
print(Udroite)
```

```
limite à droite
[5.000001, 5.00001, 5.0001]
[62.6094501124341, 62.6095599124321, 62.6106579122341]
```

```
In [94]: print(sp.limit(f,x,5,'-'))
```

```
log(5) + 61
```

```
In [95]: print(sp.limit(f,x,5,'+'))
```

```
log(5) + 61
```

```
In [96]: import numpy as np
import matplotlib.pyplot as plt
```

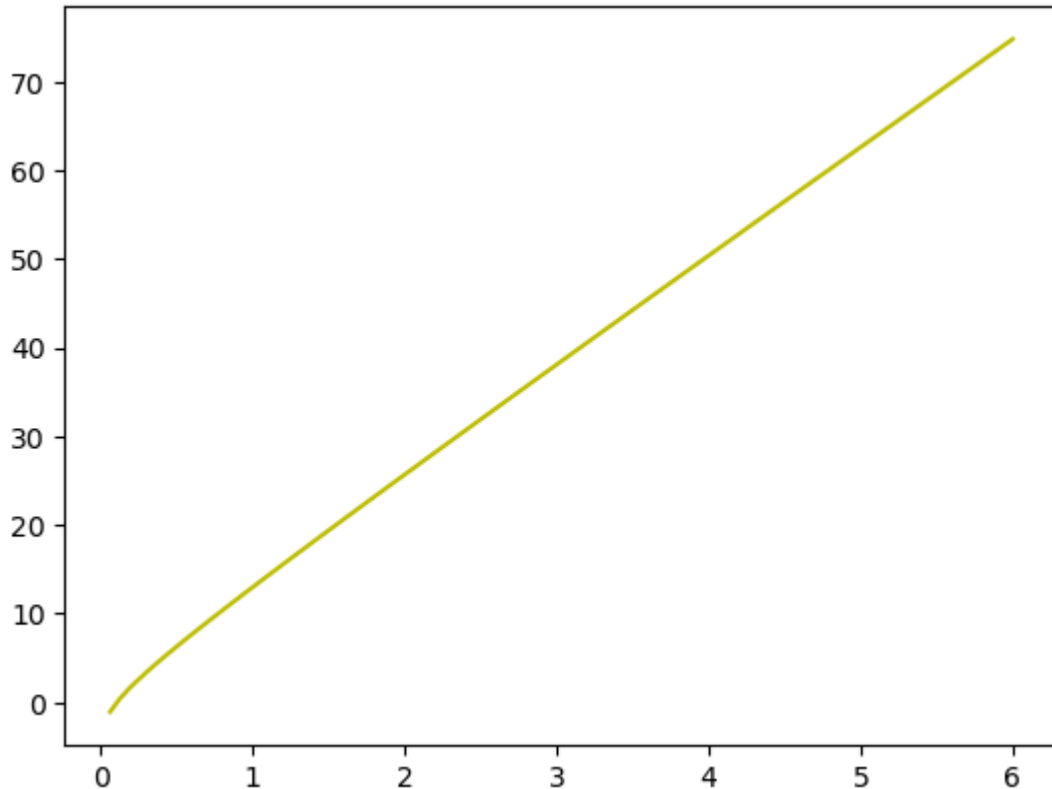
```
In [99]: x = np.linspace(0,6,100)
```

```
In [100... def f(x):  
             return np.log(x) + 12*x + 1
```

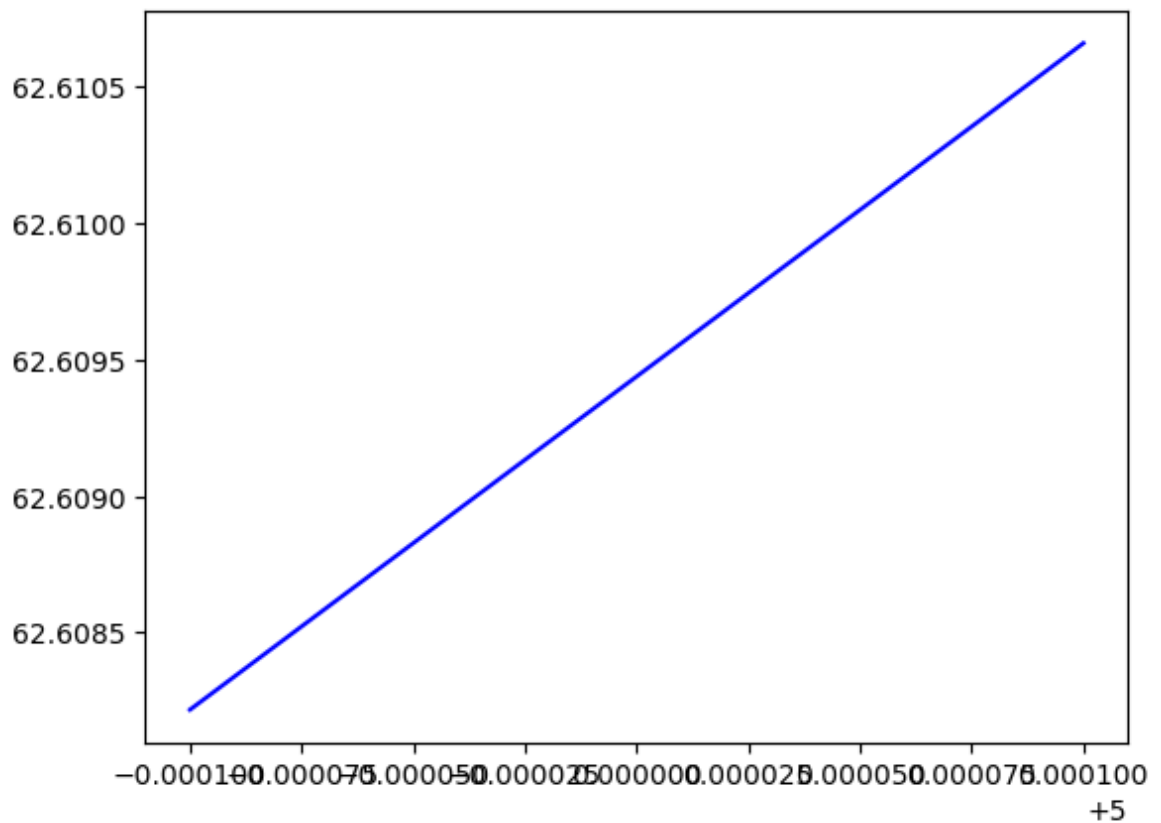
```
In [101... print(r'la courbe de f sur [0,6]')  
plt.plot(x,f(x),"y")  
plt.show()
```

la courbe de f sur [0,6]

C:\Users\DELL E7440\AppData\Local\Temp\ipykernel_16776\756664542.py:2: RuntimeWarning: divide by zero encountered in log
return np.log(x) + 12*x + 1



```
In [102... x = np.linspace(4.9999,5.0001,10)  
plt.plot(x,f(x),"b")  
plt.show()
```



```
In [103... Vgauche = np.array([4.9999,4.99999,4.999999])
print("limite à gauche")
Ugauche = f(Vgauche)
print(Vgauche)
print(Ugauche)
```

```
limite à gauche
[4.9999  4.99999  4.999999]
[62.60821791 62.60931591 62.60942571]
```

```
In [104... Vdroite = np.array([5.000001,5.00001,5.0001])
print("limite à droite")
Udroite = f(Vdroite)
print(Vdroite)
print(Udroite)
```

```
limite à droite
[5.000001 5.00001  5.0001 ]
[62.60945011 62.60955991 62.61065791]
```

In []: