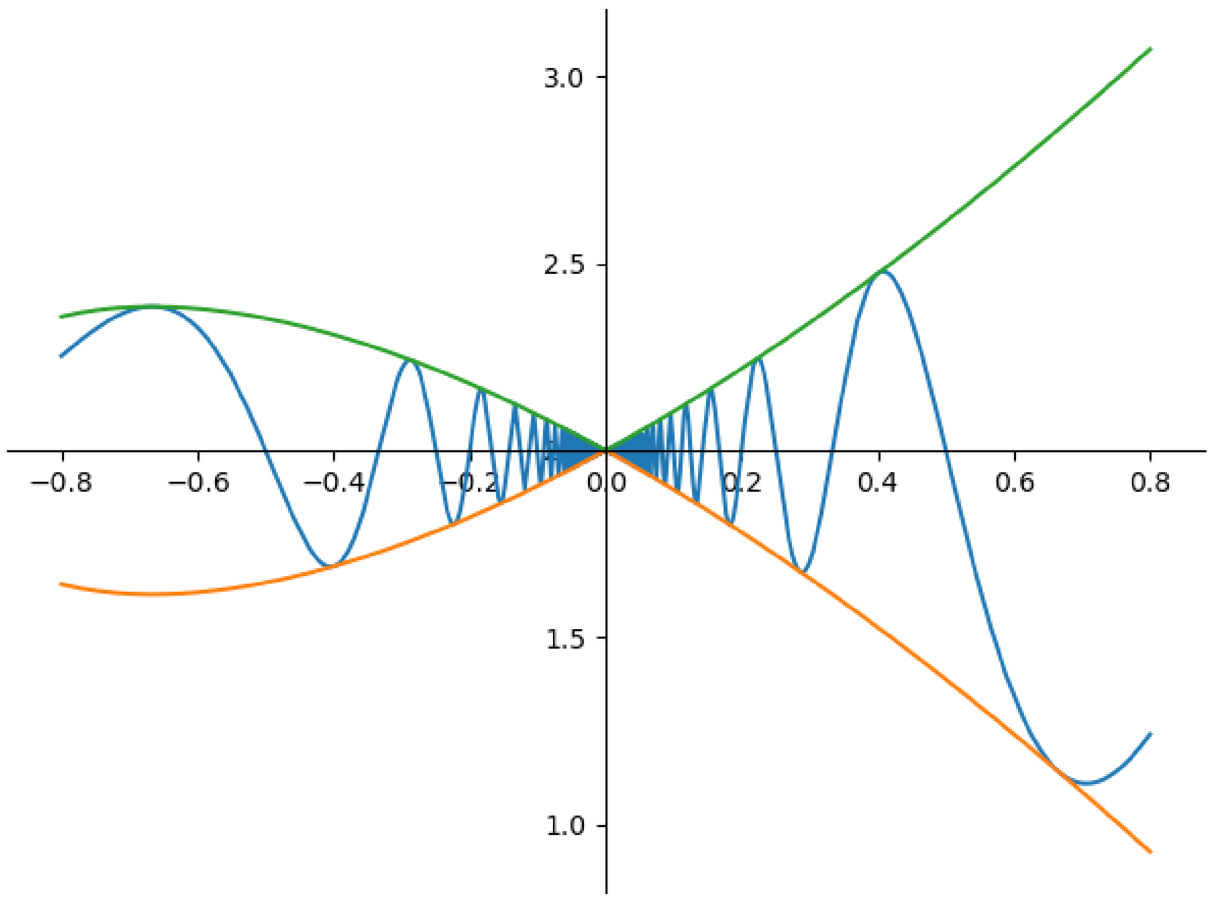
In [21]:
```
print('Jaeheon Kim, Nico Bui, Alex Dao, Vishwa Kumaravel')
```

```
Jaeheon Kim, Nico Bui, Alex Dao, Vishwa Kumaravel
```

In [20]:
```
from sympy import *
from sympy.plotting import (plot,plot_parametric)
x=symbols('x')
f = sqrt(x**3 + x**2) * sin(pi/x) + 2
g = -sqrt(x**3 + x**2) + 2
h = sqrt(x**3 + x**2) + 2
print('part 1a')
plot_parametric((x, f), (x, g), (x, h), (x, -0.8, 0.8))
print('part (1b)')
print("The squeeze theorem states that if g(x)≤f(x)≤h(x) for all x in some interval, a
print("then limx→0 f(x)=L")
print("to solve limx→0 g(x) we plug in 0 into the x of -sqrt(x3 + x2) + 2 which become
print("to solve limx→0 h(x) we plug in 0 into the x of sqrt(x3 + x2) + 2 which becomes
print("limx→0 g(x)= 2 and limx→0 h(x)= 2 so limx→0 f(x)= 2")
print('part (1c)')
print ("limx→0 g(x) is " , limit( g ,x ,0) )
print ("limx→0 h(x) is " , limit( h ,x ,0) )
print ("limx→0 f(x) is " , limit( f ,x ,0) )
print("This shows that the limits match the reasoning of part B")
```

```
part 1a
```



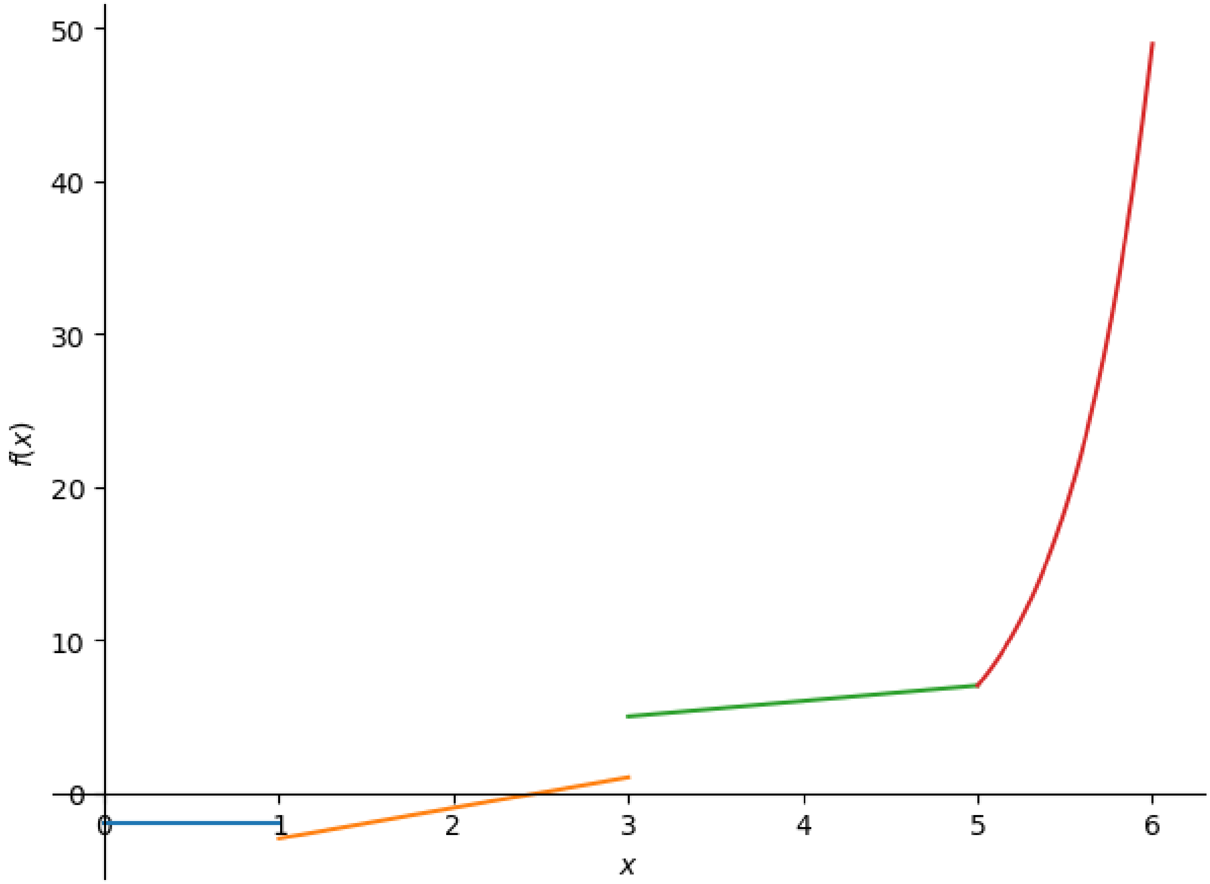
```
part (1b)
The squeeze theorem states that if g(x)≤f(x)≤h(x) for all x in some interval, and lim
x→0 g(x) = limx→0 h(x) = L
then limx→0 f(x)=L
to solve limx→0 g(x) we plug in 0 into the x of -sqrt(x3 + x2) + 2 which becomes -0 +
2 = 2
to solve limx→0 h(x) we plug in 0 into the x of sqrt(x3 + x2) + 2 which becomes 0 + 2
= 2
limx→0 g(x)= 2 and limx→0 h(x)= 2 so limx→0 f(x)= 2
part (1c)
limx→0 g(x) is  2
limx→0 h(x) is  2
limx→0 f(x) is  2
This shows that the limits match the reasoning of part B
```

In [19]:

```python
from sympy import *

x = symbols('x')
g_left = -2
g_middle1 = 2*x - 5
g_middle2 = (x**2 - 2*x - 8) / (x - 4)
g_right = E**((x - 4) * ln(7))
print('part 2(a)')
print ("The left - hand limit is", limit ( g_left ,x , 1) )
print ("The right - hand limit is", limit ( g_middle1 ,x , 1) )
print('because the left and right limit do not match, f(1) is not continuous')
print('part 2(b)')
print ("The left - hand limit is", limit ( g_middle1 ,x , 3) )
print ("The right - hand limit is", limit ( g_middle2 ,x , 3) )
print('because the left and right limit do not match, f(3) is not continuous')
print('part 2(c)')
print ("The left - hand limit is", limit ( g_middle2 ,x , 5) )
print ("The right - hand limit is", limit ( g_right ,x , 5) )
print('because the left and right limit do match, f(5) is continuous')
print('part 2(d)')
plot((g_left,(x,0,1)),
     (g_middle1,(x,1,3)),
     (g_middle2,(x,3,5)),
     (g_right,(x,5,6)))
```

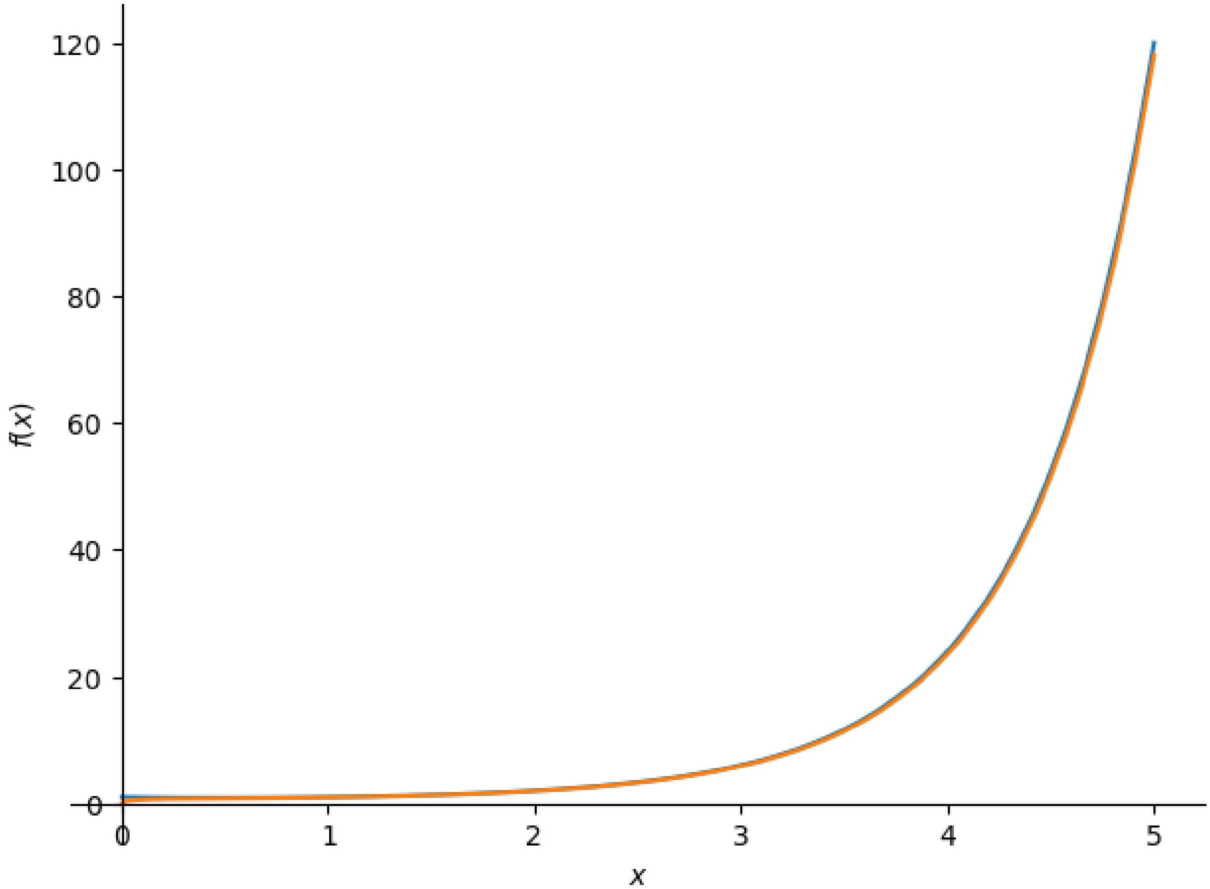
```
part a
The left - hand limit is -2
The right - hand limit is -3
because the left and right limit do not match, f(1) is not continuous
part b
The left - hand limit is 1
The right - hand limit is 5
because the left and right limit do not match, f(3) is not continuous
part c
The left - hand limit is 7
The right - hand limit is 7
because the left and right limit do match, f(5) is continuous
part d
```



Out[19]: <sympy.plotting.plot.Plot at 0x1edd389f110>

In [13]:
```
print('3(a)')
x = symbols('x')
f = factorial(x)
g = sqrt(2*pi*x)*(x/E)**x
proof = limit((g/f),x,oo)
print('g(x) i a good approximation since limit((g/f),x,oo) is', proof)
print('\3(b)')
plot(f,g,(x,0,5))
print('f(x) and g(x) have the same graph, so this is a nice approximation')
```

```
3(a)
g(x) is a good approximation since limit((g/f),x,oo) is 1
3(b)
```



f(x) and g(x) have the same graph, so this is a nice approximation

In [ ]: