MATH 151 Lab 8

Put team members' names and section number here.

In [2]:
```
import math
from sympy import *
from sympy import Symbol, N
from sympy.plotting import (plot,plot_parametric)
```

Question 1

1a

In [3]:
```
x = symbols('x', real=True)

y = (1+26/x)**x


handFoundDerrivative = y * (ln(1+26/x)+x*(1/(1+26/x))*(-26/x**2))

print("found derrivitve of y", handFoundDerrivative)
```

```
found derrivitve of y (1 + 26/x)**x*(log(1 + 26/x) - 26/(x*(1 + 26/x)))
```

1b

In [4]:
```
print("F(x) in the context of the question is simply,",diff(y))
print("G(x) in the context of the question is simply 1")

print("thus the limit of F(x) as x -> infinity is", limit(diff(y),x,oo))
print("thus the limit of G(x) as x -> infinity is", limit(1,x,oo))
```

```
F(x) in the context of the question is simply, (1 + 26/x)**x*(log(1 + 26/x) - 2
6/(x*(1 + 26/x)))
G(x) in the context of the question is simply 1
thus the limit of F(x) as x -> infinity is 0
thus the limit of G(x) as x -> infinity is 1
```

1c

In [5]:
```
print("the limit of y as x approaches infinity is zero due to the intermediate co
print("where F(x) the numerator is 0 and G(x) the denominator is one after one ro
```

```
the limit of y as x approaches infinity is zero due to the intermediate computa
tion above.
where F(x) the numerator is 0 and G(x) the denominator is one after one roudn o
f L'Hospitals Rule as x-> oo
```

1d

In [6]:
```
print("as validation that my derrivation si correct i will subtract the derrivati

print("y' - myDerrivative:", diff(y) - handFoundDerrivative)
```

```
as validation that my derrivation si correct i will subtract the derrivatives f
rom eachother:
y' - myDerrivative: 0
```

Question 2

2a

In [12]:
```
print("2r = D = sqrt((b+20)^2 + (a+8)^2)")
print("r = sqrt((b+20)^2 + (a+8)^2)/2")

print("radius is:", sqrt((50+20)**2 + (42+8)**2)/2)
```

```
2r = D = sqrt((b+20)^2 + (a+8)^2)
r = sqrt((b+20)^2 + (a+8)^2)/2
radius is: 5*sqrt(74)
```

2b

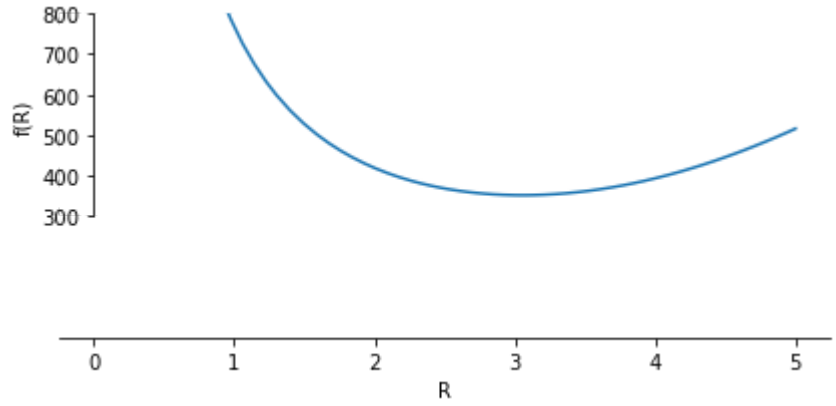
In [13]:
```
print("think of the dimensions for this system. the hypotenuse is 55inches")
print("that means a is only 55/sqrt(2) - 20 or",N(55/sqrt(2) - 20))
print("that means b is only 55/sqrt(2) - 8 or",N(55/sqrt(2) - 8))
```

```
think of the dimensions for this system. the hypotenuse is 55inches
that means a is only 55/sqrt(2) - 20 or 18.8908729652601
that means b is only 55/sqrt(2) - 8 or 30.8908729652601
```

Question 3

3a

In [31]:
```
R = symbols('R', real=True)

h = (590 * 3) / (math.pi * (R**2 +4*R**2 + 2*R**2))




#V = (1/3) * math.pi * h * (R1**2 + R2**2 + R1*R2)

SA = math.pi*(3*R)*sqrt((R)**2 + h**2)+math.pi*(R**2+2*R**2)

plot(SA,(R,0,5),ylim=[300,800])

r = solve(diff(SA))[0]
```



3b

In [32]:
```
print("for the optimized cup r1 is:", r)
print("for the optimized cup r2 is:", 2*r)
print("for the optimized cup h is:", h.subs(R,r))
```

```
for the optimized cup r1 is: 3.05299987641967
for the optimized cup r2 is: 6.10599975283934
for the optimized cup h is: 8.63518766231217
```

Question 4

4a

In [38]:
```
print("the first integral of f'' is", integrate(5/((x+1)**2),x), "+ 8")
print("the second integral of f'' is", integrate(integrate(5/((x+1)**2),x)+8), "+
```

```
the first integral of f'' is -5/(x + 1) + 8
the second integral of f'' is 8*x - 5*log(x + 1) + 9
```

4b

In [47]:
```
f = integrate(integrate(5/((x+1)**2),x))
c1 = (-f.subs(x,1)+f.subs(x,4))/3

c2 = f.subs(x,4) + 4 * c1 -10

print(N((-f.subs(x,1)+f.subs(x,4))/3), "= c1")

print(N(c2), "= c2")
```

```
-1.52715121979026 = c1
-24.1557944413315 = c2
```

In [ ]:

In [ ]: