MATH 152 Lab 1

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In [ ]:
```
import sympy as sp
from sympy.plotting import (plot,plot_parametric)
```

Instructions: Complete the lab assignment in your assigned groups. Unless stated otherwise, your answers should be obtained using Python code.

Do not modify the cell above, as it contains all the packages you will need. It is highly recommended to not use any additional packages.

NOTE: If you took MATH 151 last semester, notice that the import statement for SymPy is different- for each SymPy command you use, you have to preface it with "sp." For example, "symbols('x')" becomes "sp.symbols('x')". **Except for plot and plot_parametric**- you don't need to type "sp." for those.

Question 1

1a

In [ ]:
```
x, y  = sp.symbols('x y', real = True)
formula_1 = 100 - 2*x
A_x = x*y
A_x= A_x.subs(y,formula_1)
print('A(x):')
display(A_x.expand())
```

```
A(x):
```

$$-2x^2 + 100x$$

1b

In [ ]:
```
print("When the sides perpendicular are 15 yards")
A_x = A_x.subs(x,15)
print("Area =",A_x, "Yards")
```

```
When the sides perpendicular are 15 yards
Area = 1050 Yards
```

1c

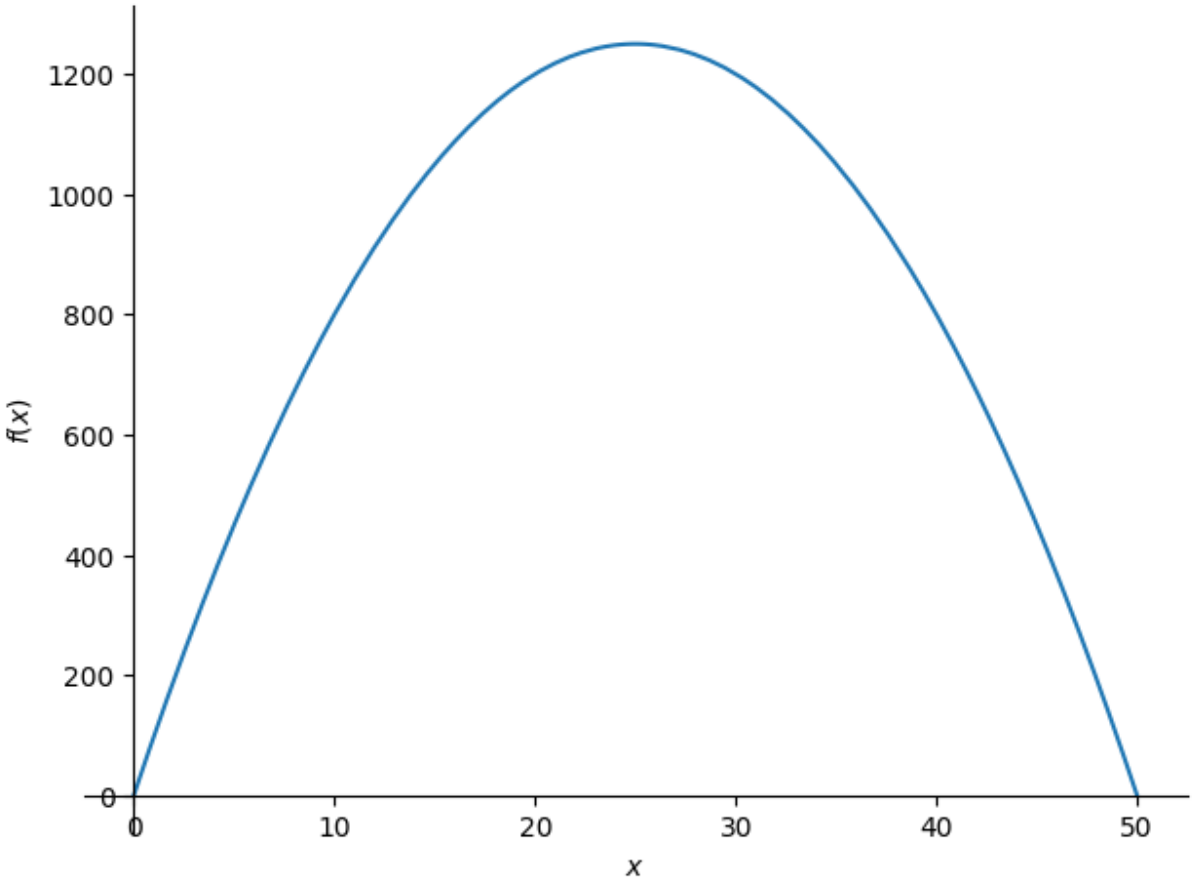
In [ ]:
```
formula_1 = 100 - 2*x
A_x = x*y
A_x = A_x.subs(y,formula_1).expand()
A_x -= 1200
```

```
print("the sides need to be either", sp.solve(A_x.expand(),x), "yards each")
```

```
the sides need to be either [20, 30] yards each
```

1d

In [ ]:
```
formula_1 = 100 - 2*x
A_x = x*y
A_x1 = A_x.subs(y,formula_1).expand()
x1 = plot(A_x1, (x,0,50))
```



1e

In [ ]:
```
values_x = sp.solve(sp.diff(A_x1),x)
print("The maxmize x value is:", *values_x, "giving us A:", A_x1.subs(x,valu
```

```
The maxmize x value is: 25 giving us A: 1250
```

Question 2

2a

In [ ]:
```
formula_2 = (x** 5) * ((x**3) + 16)**sp.Rational(1,2)
ux = x**3  + 16
du = sp.diff(u)

print("u =")
```

```
display(ux)
print("du =")
display(du)
```

u =

$x^3 + 16$

du =

1

2b

In [ ]:
```
u, du, c = sp.symbols('u  du C', real = True, positive = True)
new_f = u*sp.sqrt(u+16)
new_f_right = (u * sp.sqrt(u)).simplify()
new_f_left = (16*sp.sqrt(u))
int_x = sp.integrate(new_f_right)
int_x2 = sp.integrate(new_f_left)

new_f = sp.Rational(1,3)*((int_x) - int_x2)
new_f = new_f.subs(u,ux)
display((new_f)+c)
```

$$C + \frac{2\left(x^3 + 16\right)^{\frac{5}{2}}}{15} - \frac{32\left(x^3 + 16\right)^{\frac{3}{2}}}{9}$$

2c

In [ ]:
```
#start code here
formula_3 = sp.integrate(formula_2).simplify()
display(formula_3 + c)
```

$$C + \frac{2\sqrt{x^3 + 16} \cdot \left(3x^6 + 16x^3 - 512\right)}{45}$$

2d

In [ ]:
```
#start code here
left = new_f.subs(x,-1)
right = new_f.subs(x,1)
final = right - left
display(final)
```

$$-\frac{986\sqrt{17}}{45} + \frac{70\sqrt{15}}{3}$$

2e

In [ ]:
```
#start code here
display(sp.Integral(formula_2,(x,-1,1)))
sp.integrate(formula_2,(x,-1,1))
```

$$\int_{-1}^{1} x^5 \sqrt{x^3 + 16}\, dx$$

Out[ ]: $$-\frac{986\sqrt{17}}{45} + \frac{70\sqrt{15}}{3}$$