Maximum and Minimum for Single variable

AIM

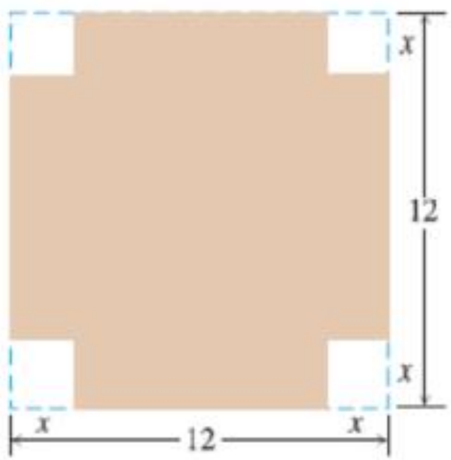
- To find the Maximum and minimum by using Second derivative test
- To visualize the curve with maximum point and the minimum point

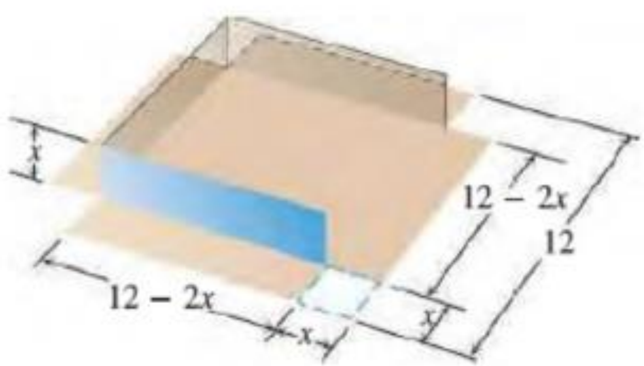
```
clc
clear all
syms x  real
f= input('Enter the function f(x):');
fx= diff(f,x)
c = solve(fx)
cmin = min(double(c));
cmax = max(double(c));
ezplot(f,[cmin-2,cmax+2])
hold on
fxx= diff(fx,x);
```

```
for i = 1:1:size(c)
    T1 = subs(fxx, x ,c(i) );
     T3= subs(f, x, c(i));
 if (double(T1)==0)
    sprintf('The point x is %d inflexion point',double (c(i)))
    else
        if (double(T1) < 0)
    sprintf('The maximum point x is %d', double(c(i)))
    sprintf('The value of the function is %d', double (T3))
        else
    sprintf('The minimum point x is %d', double(c(i)))
              sprintf('The value of the function is %d', double (T3))
        end
 end
plot(double(c(i)), double(T3), 'r*', 'markersize', 15);
 end
hold off
```

1) An open-top box is to be made by cutting small congruent squares from the comers of a 12-in.-by-12-in. sheet of tin and bending up the sides. How large should the squares cut from the corners be to make the box hold as much as possible?

Solution



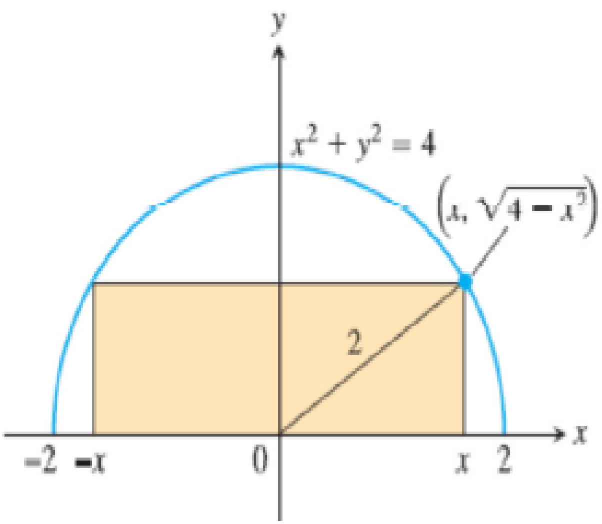


The volume of the box is a function of 'x' (which is corner square) :

$$V(x) = x(12-2x)^2 = 4x^3 - 48x^2 + 144x.$$

2) A rectangle is to be inscribed in a semicircle of radius 2. What is the largest area the rectangle can have, and what are its dimensions?

Solution:



Length :2x, Height: $\sqrt{4-x^2}$ Area: 2x $\sqrt{4-x^2}$. A(x)= 2x $\sqrt{4-x^2}$.