

Environment: Matlab 2019

1.

- * Run `problem_1.m` and see the result.

```
>> problem_1
```

[Local minimum found that satisfies the constraints.](#)

Optimization completed because the objective function is non-decreasing in [feasible directions](#), to within the value of the [optimality tolerance](#), and constraints are satisfied to within the value of the [constraint tolerance](#).

[<stopping criteria details>](#)

When the radius of the semicircle = 1.400248, can get the maximum area = 7.001239

- * To find maximum f == find minimum $-f$
- * objective function = $-(0.5\pi x^2 + 2x \cdot (10 - x\pi - 2x)/2)$, get the x when finding the minimum.
- * Use `fmincon` in MATLAB to calculate.

2.

- * Run `problem_2.m` and see the result.

```
>> problem_2
```

[Local minimum found that satisfies the constraints.](#)

Optimization completed because the objective function is non-decreasing in [feasible directions](#), to within the value of the [optimality tolerance](#), and constraints are satisfied to within the value of the [constraint tolerance](#).

[<stopping criteria details>](#)

Minimize Z with f1, f2, f3 three constraints, get answers:

F1= 134.2, F2= 0.0, F3= 0.0, F4= 707.7, F5= 295.4, F6= 0.0, F7= 0.0, F8= 718.0, F9= 0.0, Z = 940.6

- * Use `fmincon` function to minimize Z with equality constraints.
- * Choose starting $F = [0, 0, 0, 0, 0, 0, 0, 0, 0]$.

3.

- * Run `problem_3.m` and see the result. (The figure is in the next page.)
- * Use simplex method to finish the linear programming part.
- * Use `fmincon` function to finish the non-linear programming part.

```
>> problem_3
```

From simplex method,

when $x_1 = 0.2$, $x_2 = 0.0$, $x_3 = 1.6$, maximize value = 5.4

[Local minimum found that satisfies the constraints.](#)

Optimization completed because the objective function is non-decreasing in [feasible directions](#), to within the value of the [optimality tolerance](#), and constraints are satisfied to within the value of the [constraint tolerance](#).

<[stopping criteria details](#)>

Use a nonlinear programming method, and get answers:

$X_1 = 0.2$, $X_2 = 0.0$, $X_3 = 1.6$, $F = 5.4$