Exercises 7.2

2. Solve the problem above using the Galerkin method with two basis functions. You may need symbolic manipulation software inorder to speed up your calculations.

```
clear all
clc
syms x
syms c1 c2
```

```
N1 = x*(x-1);
N2 = x*x*(x-1);
y  = @(x) c1*N1+c2*N2;
R  = @(x)diff((y(x)),2) + y(x) - 2*x;
w1 = N1;
w2 = N2;
A1 = int(R(x)*w1, 0, 1);
A2 = int(R(x)*w2, 0, 1);
A = solve ([A1 A2], [c1 c2]);
c1 = A.c1;
c2 = A.c2;
y  = @(x) c1*N1+c2*N2;
R  = @(x)diff((y(x)),2) + y(x) - 2*x;
yx = y(x)
```

```
yx =
```

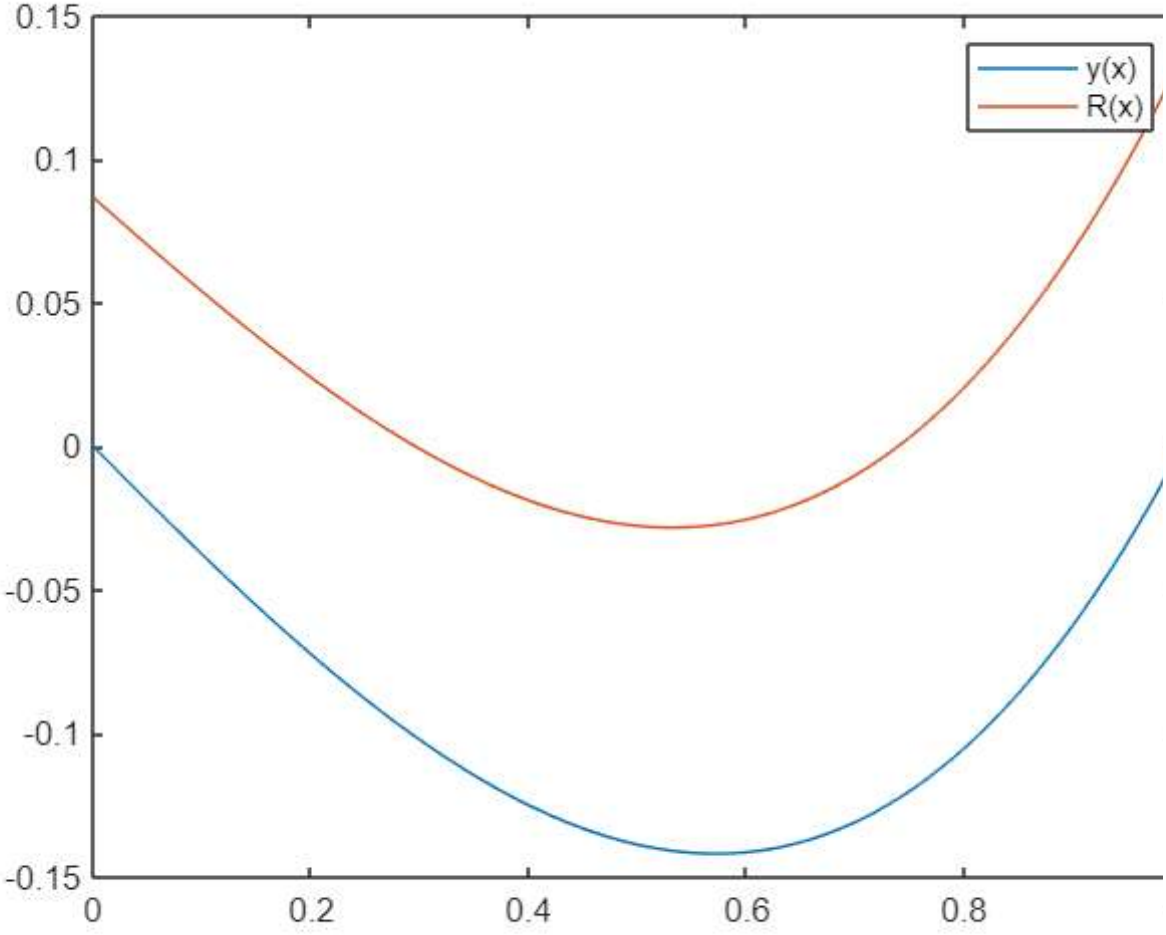
$$\frac{14\,x^2\,(x-1)}{41}+\frac{142\,x\,(x-1)}{369}$$

```
Rx = R(x)
```

```
Rx =
```

$$\frac{2\,x}{41}+\frac{14\,x^2\,(x-1)}{41}+\frac{142\,x\,(x-1)}{369}+\frac{32}{369}$$

```
X = 0:0.01:1;
y = subs (yx,x, X);
R = subs (Rx,x, X);
plot(X,y,X,R)
legend ('y(x)','R(x)')
```


y(x)
R(x)
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
0
0.2
0.4
0.6
0.8