Assignment for ODE with b.c.

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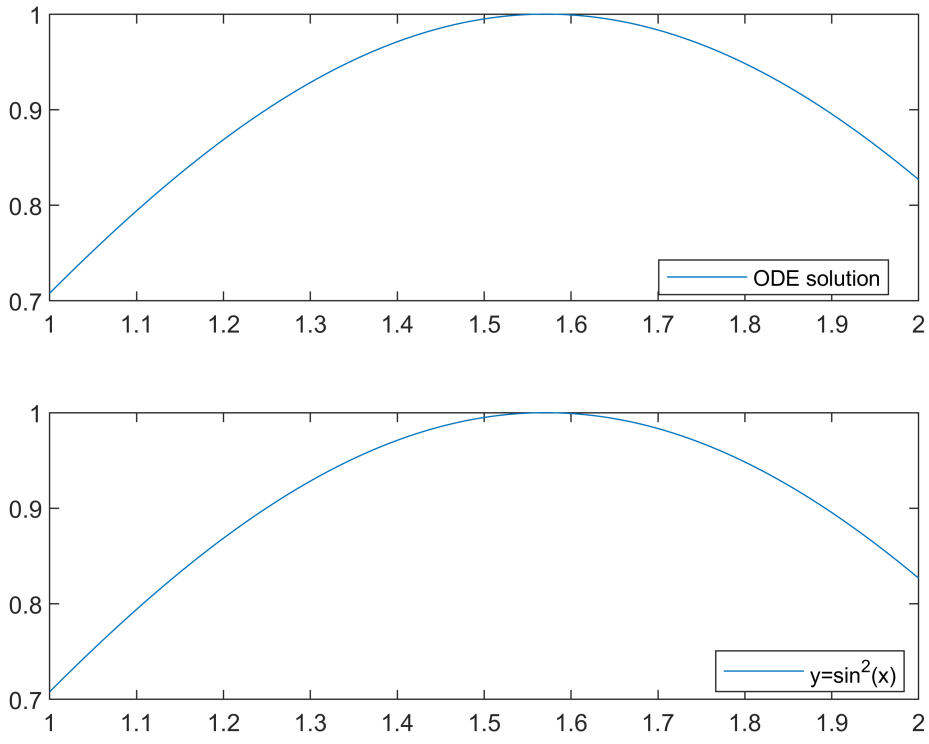
Problem 1

```
clear all; clc;
solinit1 = bvpinit(linspace(1,2,10),[1 -1]);
sol1 = bvp4c(@bvpfun1,@bcfun1,solinit1);
xint1 = linspace(1,2);
S1 = deval(sol1,xint1,1);
figure;
subplot(2,1,1);
plot(xint1, S1);
legend("ODE solution","Location","best");
subplot(2,1,2);
ysin = sin(xint1).^2;
plot(xint1, ysin);
legend("y=sin^2(x)","Location","best");
```



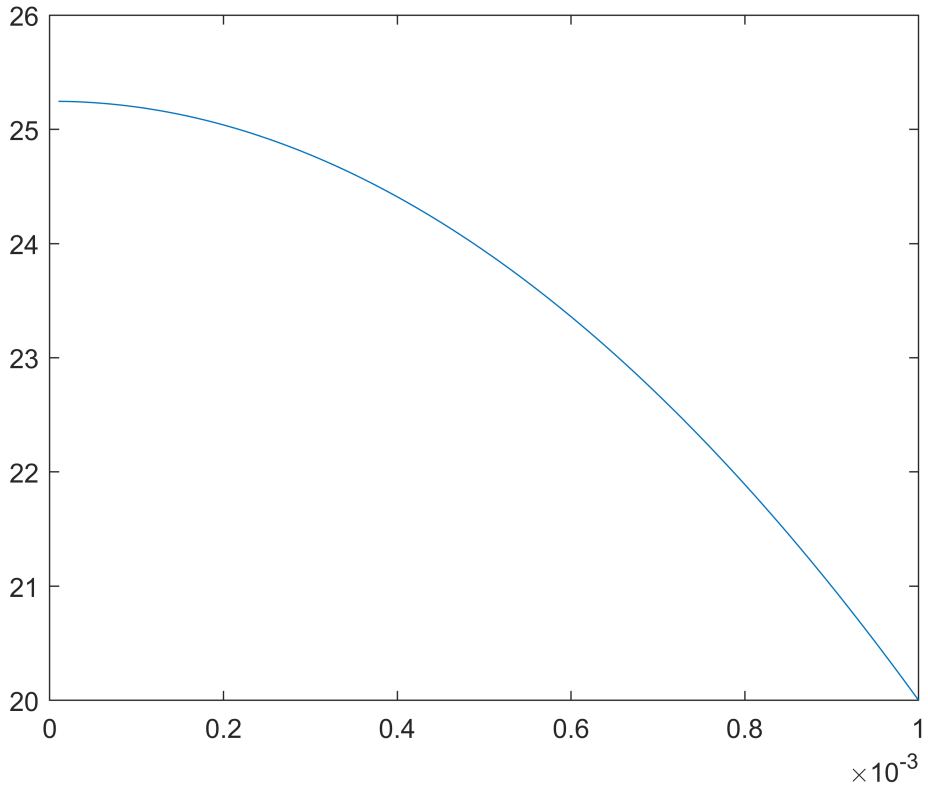

```
disp('They are almost the same.');
```

```
They are almost the same.
```

Problem 2

```
clear all; clc;
solinit2 = bvpinit(linspace(0.00001,0.001,10),[1 0]);
```

```
sol2 = bvp4c(@bvpfun2,@bcfun2,solinit2);
xint2 = linspace(0.00001,0.001);
S2 = deval(sol2,xint2,1);
plot(xint2, S2);
```

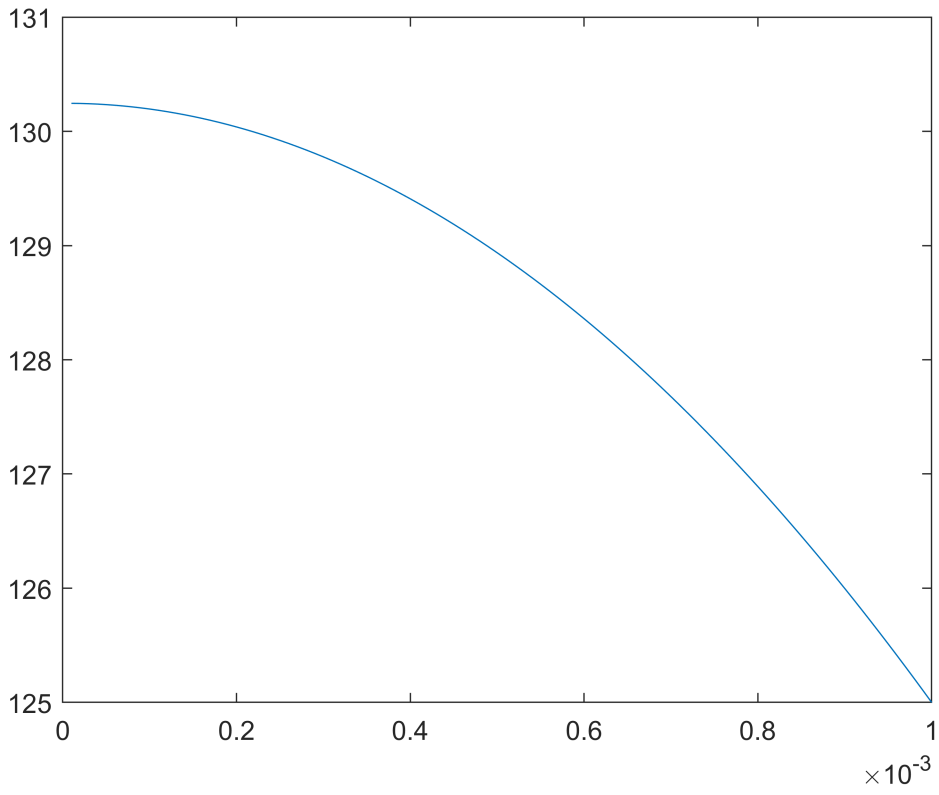



```
fprintf("The peak temperature is: %.2f C\n", max(S2));
```

```
The peak temperature is: 25.25 C
```

Problem 3

```
clear all; clc;
solinit3 = bvpinit(linspace(0.00001,0.001,10),[1 0]);
sol3 = bvp4c(@bvpfun3,@bcfun3,solinit3);
xint3 = linspace(0.00001,0.001);
S3 = deval(sol3,xint3,1);
plot(xint3, S3);
```




```
fprintf("The peak temperature is: %.2f C\n", max(S3));
```

```
The peak temperature is: 130.25 C
```

Functions

```
% P1
```

```
function dydx = bvpfun1(x,y)
dydx = [y(2) 2-4*y(1)^2/sin(x)^2];
end
function res = bcfun1(ya,yb)
res = [ya(2)-2*sin(1)*cos(1) yb(1)-sin(2)^2];
end

% P2
function dydx = bvpfun2(x,y)
k=0.1; Q=2.1e6;
dydx = [y(2) -1/x*y(2)-Q/k];
end
function res = bcfun2(ya,yb)
res = [ya(2) yb(1)-20];
end

% P3
function dydx = bvpfun3(x,y)
k=0.1; Q=2.1e6;
```

```
dydx = [y(2) -1/x*y(2)-Q/k];
end
function res = bcfun3(ya,yb)
h=10; Te=20; Q=2.1e6; R=0.001;
res = [ya(2) yb(1)-Te-Q*R/(2*h)];
end
```