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```
% Divide the interval into 8 nodes,so the step size is pi/7
h = pi/7;

%x values
x = 0:pi/7:pi;

%After expansion of y'' and y' using finite element method we get a
 matrix
%of type Ax = B where x is the coefficients matrix with y values from
 y1 to
%y8
```

Matrices

```
%you can manually enter the matrix or use matlab inbuilt functions
%A = [ 1 0 0 0 0 0 0 0; 2+h -4 2-h 0 0 0 0 0; 0 2+h -4 2-h 0 0 0 0; 0
 0 2+h -4 2+h 0 0 0;...
%     0 0 0 2+h -4 2-h 0 0; 0 0 0 0 2+h -4 2-h 0; 0 0 0 0 0 2+h -4 2-
h; 0 0 0 0 0 0 0 1]


A = full(gallery('tridiag',8,2+h,-4,2-h));
A(1,:) = [ 1 0 0 0 0 0 0 0];
A(8,:) = [ 0 0 0 0 0 0 0 1];
A
B = [0 2*(h.^2)*cos(pi/7) 2*(h.^2)*cos(2*pi/7) 2*(h.^2)*cos(3*pi/7)
 2*(h.^2)*cos(4*pi/7) 2*(h.^2)*cos(5*pi/7)  2*(h.^2)*cos(6*pi/7) 1]'

%%y values are obtained by A \ B from Ay = B
y_values = inv(A)*B


A =

  Columns 1 through 7

    1.0000         0         0         0         0         0         0
    2.4488   -4.0000    1.5512         0         0         0         0
         0    2.4488   -4.0000    1.5512         0         0         0
         0         0    2.4488   -4.0000    1.5512         0         0
         0         0         0    2.4488   -4.0000    1.5512         0
         0         0         0         0    2.4488   -4.0000    1.5512
         0         0         0         0         0    2.4488   -4.0000
```

```
         0         0         0         0         0         0         0

  Column 8

         0
         0
         0
         0
         0
         0
    1.5512
    1.0000


B =

         0
    0.3629
    0.2512
    0.0896
   -0.0896
   -0.2512
   -0.3629
    1.0000


y_values =

         0
   -0.1702
   -0.2050
   -0.0979
    0.1289
    0.4292
    0.7413
    1.0000
```

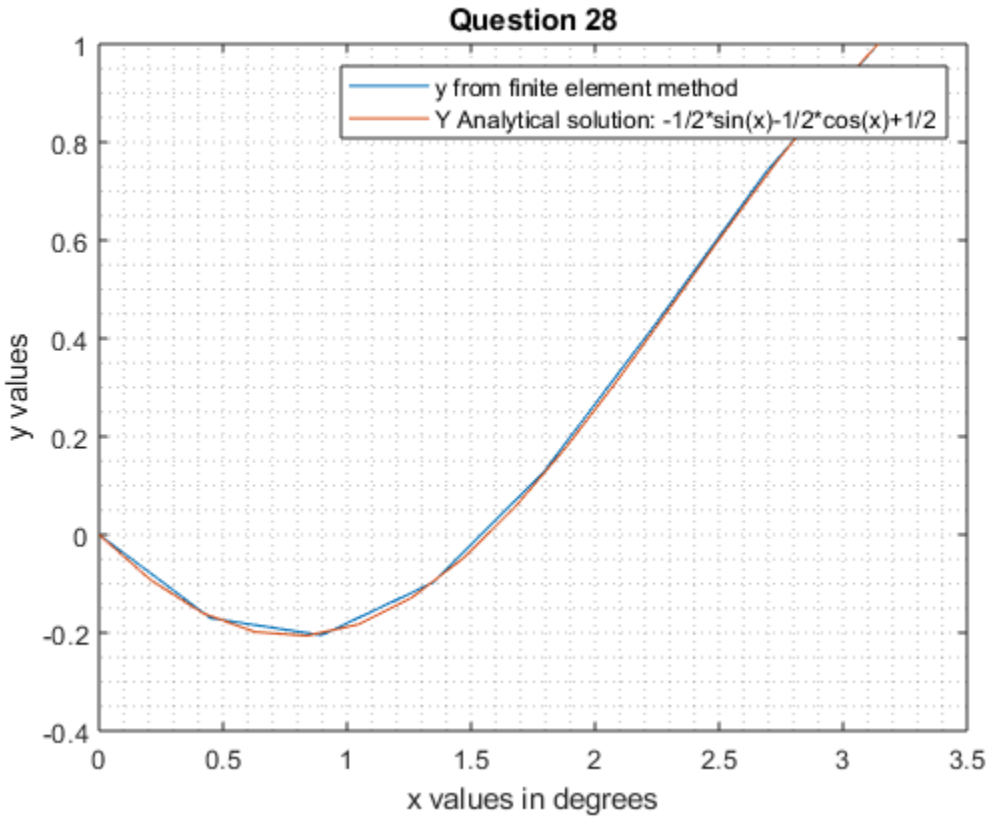
Analytical function

```
yanalytical =@(x) -1/2*sin(x) - 1/2*cos(x) + 1/2


yanalytical =

  function_handle with value:

    @(x)-1/2*sin(x)-1/2*cos(x)+1/2
```

plots

```
plot(x,y_values);
```

```
hold on;
grid minor;
plot(0:pi/15:pi,yanalytical(0:pi/15:pi))
legend('y from finite element method','Y Analytical solution:
 -1/2*sin(x)-1/2*cos(x)+1/2');
title('Question 28');
xlabel('x values in degrees');
ylabel('y values');
hold off;
```



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