

## Quiz\_03 Boundary Value Problem (bvp4c)

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Statement:

$$\frac{d^2 y}{dx^2} + y = 0$$
$$y(0) = 1, \quad y(\pi) = 0$$

Solution:

Defining a deviv function

```
Quiz_03!23_11_2023.mlx  deviv.m  +
1  function dydx = deviv( x, y)
2  % Reduciton
3  % 2nd order ODE to 1st order ODE
4  dydx(1) = y(2);
5  dydx(2) = -y(1);
6  end
7
```

Defining the boundary condition function

```
Quiz_03!23_11_2023.mlx  deviv.m  bcs.m  +
1  function res = bcs(ya, yb)
2  res = [ya(2)-1 yb(1)];
3  end
```

Using bvpinit for the initial guess on the interval

```
Solinit = bvpinit([0,pi],[0,0])
```

```
Solinit = struct with fields:
    solver: 'bvpinit'
    x: [0 3.1416]
    y: [2x2 double]
    yinit: [0 0]
```

bvp4c Iteration for the solution of non-linear system of equations

```
%bvp4c
Sol = bvp4c(@deviv, @bcs, Solinit);
```

```
figure ;
plot(Sol.x, Sol.y(1,:), '-o', 'LineWidth',2 , 'MarkerSize', 8, 'MarkerFaceColor','g')
grid on;
```

```
xlabel('x')  
ylabel('y')  
title('Boundary Value Problem Solution using bvp4c')  
legend('bvp4c', 'Location', 'Best')
```

