

Question-7. A

Code:-

```
y0 = [0, 0];  
[x, y] = ode45(@soln, [0, 10], y0);  
function dydx = soln(x, y)  
    dydx = zeros(2, 1);  
    dydx(1) = y(2);  
    dydx(2) = cos(2 * x) - y(1);  
end
```

Explanation:-

- The MATLAB code solves a system of two first-order ordinary differential equations using the `ode45` solver, which is based on the Runge-Kutta method.
- Initial conditions for the system are set as `[0, 0]`.
- The solution is computed over the interval $x = 0$ to $x = 10$.

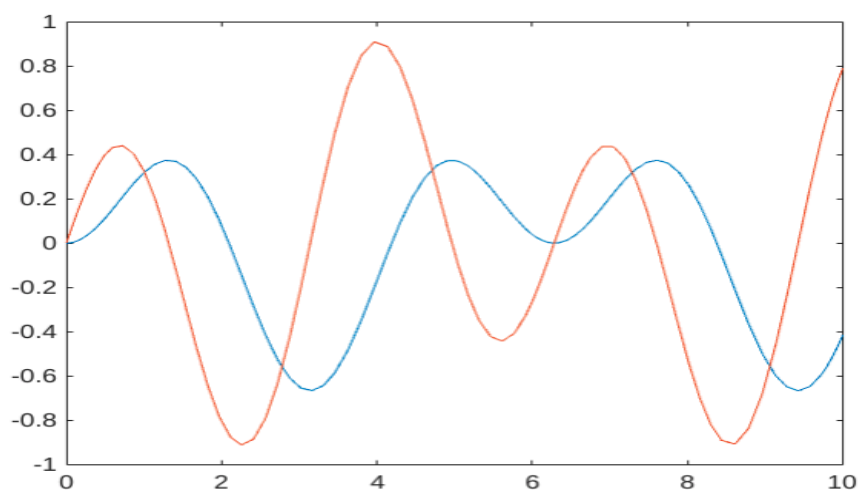
The system of equations is defined in the `soln` function:

- The first equation represents the derivative of $y(1)$ with respect to x .
- The second equation represents the derivative of $y(2)$ with respect to x .

The `ode45` function computes the solution and stores it in vectors x and y :

- x contains the values of the independent variable.
- y contains the corresponding values of the dependent variables $y(1)$ and $y(2)$.

Output:-

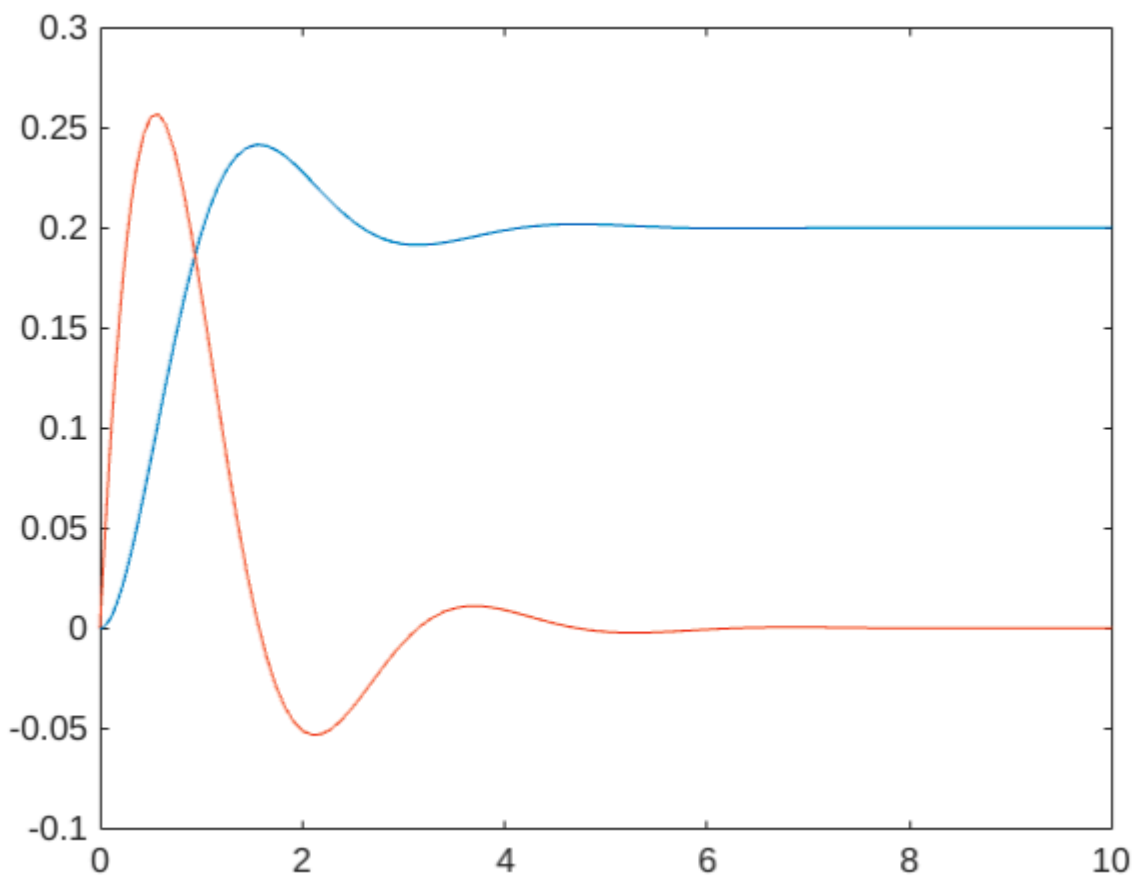


Question-7. B

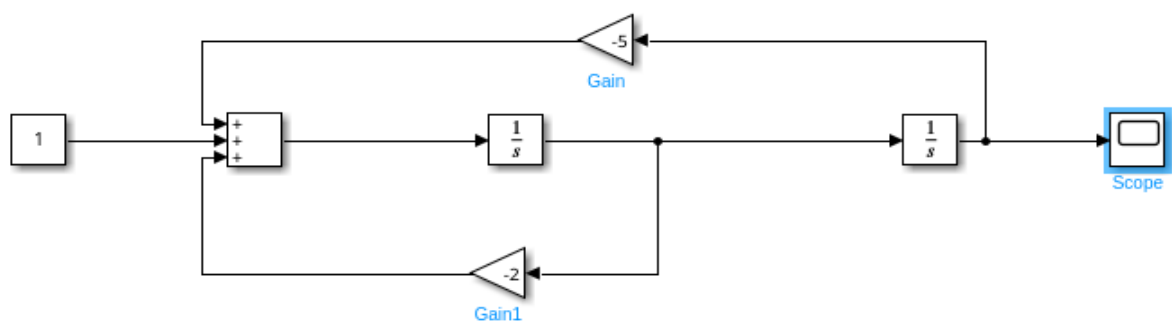
Code:-

```
y0 = [0, 0];  
[x, y] = ode45(@soln, [0, 10], y0);  
function dydx = soln(x, y)  
    dydx = zeros(2, 1);  
    dydx(1) = y(2);  
    dydx(2) = -2*y(2) - 5*y(1) + 1;  
end
```

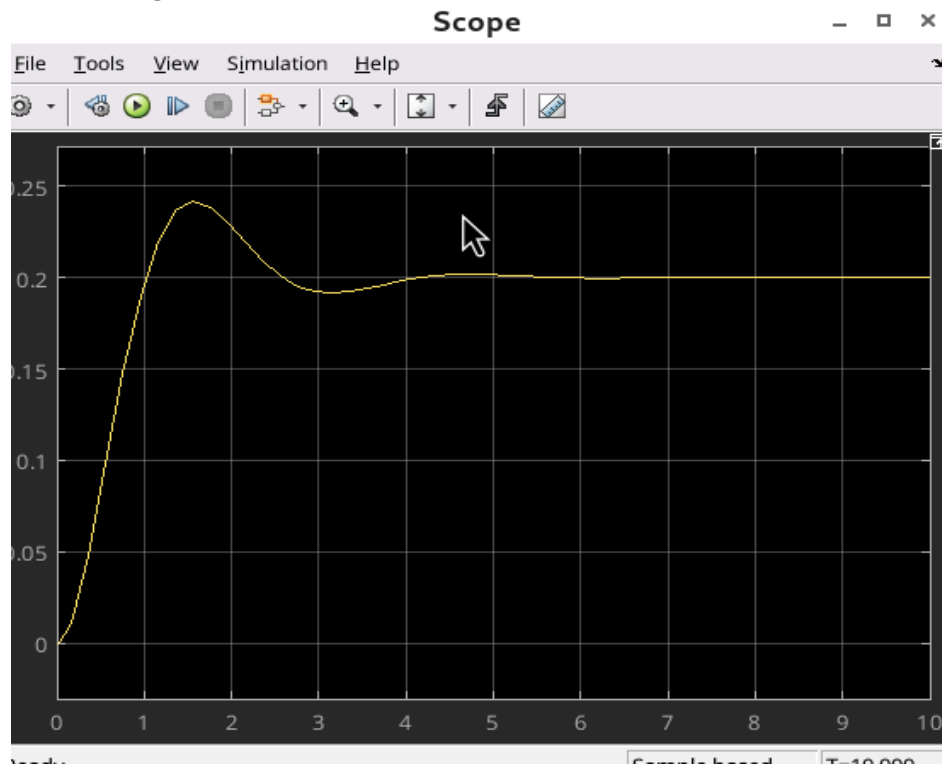
Output:-



Simulink Diagram:-



Scope Diagram:-



Question-6.

Code:-

```
x = linspace (-24, 23, 43);  
y = 2*power(x,2) + 7*x + 9;  
figure (1);  
plot (x,y);  
title ('Quadratic Polynomial');  
ylabel ('y'),xlabel('x'), grid;
```

Explanation:-

x = linspace(-24, 23, 43); Generates a vector **x** with 43 evenly spaced points between -24 and 23.

y = 2*power(x,2) + 7*x + 9; Calculates the values of the quadratic polynomial $y=2x^2+7x+9$ for each value in the **x** vector.

figure(1); Opens a new figure window, or makes figure 1 the active figure.

plot(x, y); Plots the quadratic polynomial with **x** on the x-axis and **y** on the y-axis.

title('Quadratic Polynomial'); Adds the title "Quadratic Polynomial" to the plot.

ylabel('y'); Labels the y-axis as "y".

xlabel('x'); Labels the x-axis as "x".

grid; Adds a grid to the plot for better readability.

Output (Plot) :-

