Q1

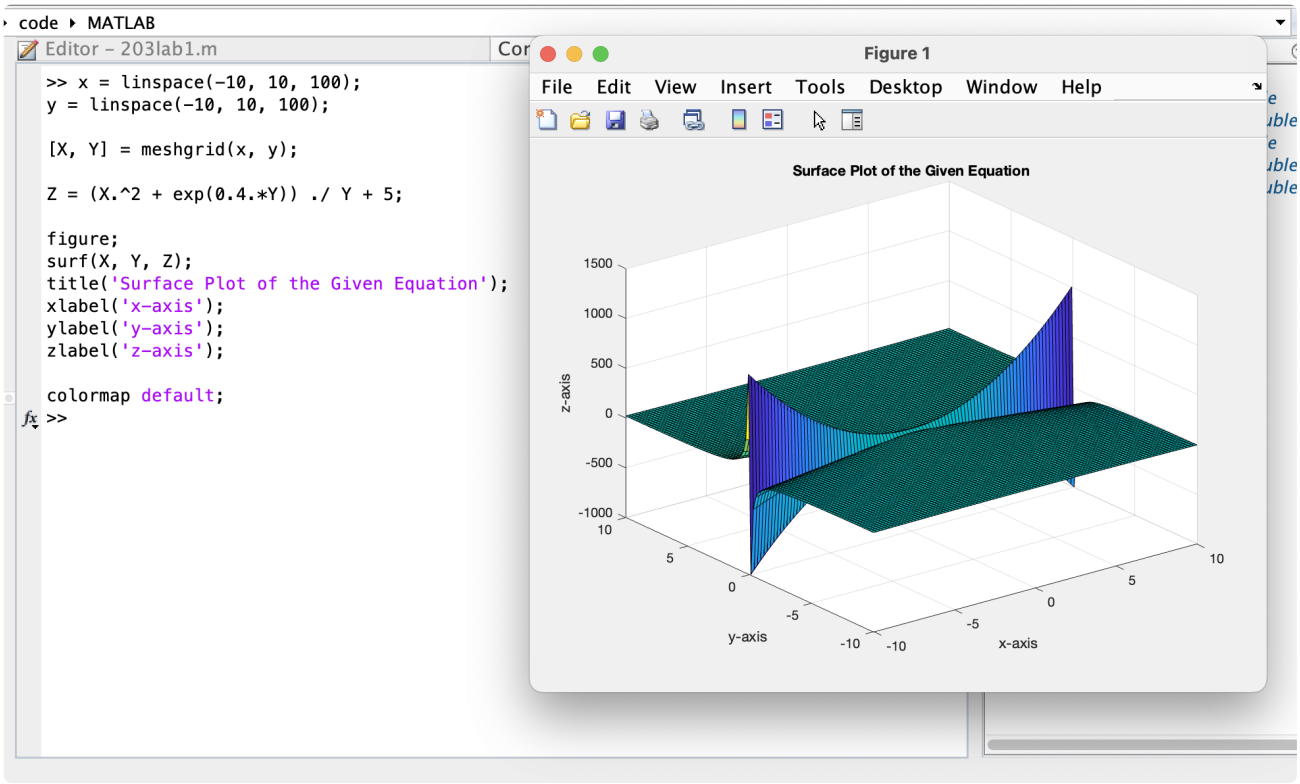
1a.

$$z = \frac{x^2 + e^{0.4y}}{y} + 5$$

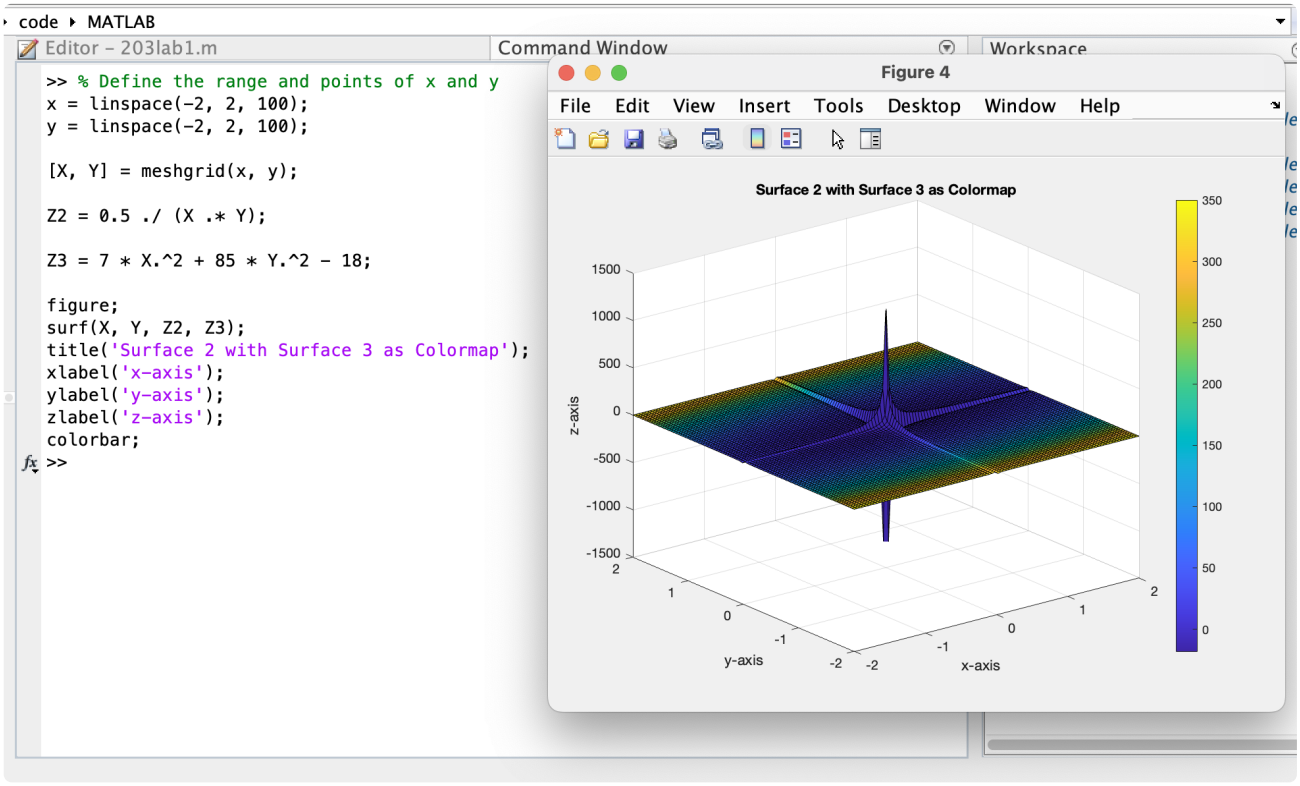
$$z = \frac{0.5}{xy}$$

$$z = 7x^2 - 18 + 85y^2$$

1b.



1c.



1d.

Equation 1:

$$z = \frac{x^2 + e^{0.4y}}{y} + 5$$
$$z - \frac{x^2 + e^{0.4y}}{y} - 5 = 0$$
$$f_1(x, y, z) = z - x^2 - e^{0.4y} - 5y = 0$$

Equation 2:

$$xyz = 0.5$$
$$z = \frac{0.5}{xy}$$
$$z - \frac{0.5}{xy} = 0$$
$$f_2(x, y, z) = xyz - 0.5 = 0$$

Equation 3:

$$7x^2 - 18 = -85y^2 + z$$
$$7x^2 - 18 + 85y^2 - z = 0$$
$$f_3(x, y, z) = 7x^2 - 18 + 85y^2 - z$$

1e.

```
function f = equations(v)
    % Extract components of v
    x = v(1);
    y = v(2);
    z = v(3);

    % Calculate the values of f1, f2, and f3
    f1 = z - exp(0.4*y) - 5*y - x^2;
    f2 = x*y*z - 0.5;
    f3 = z - 7*x^2 - 85*y^2 + 18;

    % Combine results into output f
    f = [f1; f2; f3];
end
```

1f.

```
% Main Script
% Define the initial guesses
initial_guess1 = [1, 1, 1];
initial_guess2 = [-1, -1, -1]; % Or any other appropriate guess

% Use fsolve to find the solutions
solution1 = fsolve(@equations, initial_guess1);
solution2 = fsolve(@equations, initial_guess2);

% Calculate the function values at the found solutions
function_values1 = equations(solution1);
function_values2 = equations(solution2);

% Display the solutions and corresponding function values
disp('Solution with initial guess 1:');
disp(['x = ', num2str(solution1(1)), ', y = ', num2str(solution1(2)), ',
z = ', num2str(solution1(3))]);
disp(['f1 = ', num2str(function_values1(1)), ', f2 = ',
num2str(function_values1(2)), ', f3 = ', num2str(function_values1(3))]);

disp('Solution with initial guess 2:');
disp(['x = ', num2str(solution2(1)), ', y = ', num2str(solution2(2)), ',
z = ', num2str(solution2(3))]);
disp(['f1 = ', num2str(function_values2(1)), ', f2 = ',
num2str(function_values2(2)), ', f3 = ', num2str(function_values2(3))]);
```

```
% Local function defining the system of equations
function f = equations(v)
    x = v(1);
    y = v(2);
    z = v(3);

    f1 = z - 5*y - x^2 - exp(0.4);
    f2 = x*y*z - 0.5;
    f3 = z - 7*x^2 - 85*y^2 + 18;

    f = [f1; f2; f3];
end
```