```
function [x_vals, y_vals, X, delta_x, delta_y] = general_poisson(x_iter, y_iter, TOL, ↙
max_iter)

    L = 2;
    H = 4;
    X = zeros(x_iter, y_iter, 1);
    x_vals = linspace(0,L,x_iter);
    y_vals = linspace(0,H,y_iter);

    X(1:(x_iter+1)/2,1:(y_iter+1)/2,1) = 0;
    X((x_iter+1)/2:end,1,1) = 1;
    X(1,(y_iter+1)/2:end,1) = 1;
    X(end,:,1) = 1;
    X(:,end,1) = x_vals;

    delta_x = x_vals(2) - x_vals(1);
    delta_y = y_vals(2) - y_vals(1);
    f = @(x, y) 1 + 0.2 * double(x == 1 & y == 3);
    f_mat = zeros(x_iter,y_iter);
    for i = 1:x_iter
        for j = 1:y_iter
            f_mat(i,j) = f(x_vals(i), y_vals(j));
        end
    end

    for i = 2:max_iter
        X(1:(x_iter+1)/2,1:(y_iter+1)/2,1) = 0;
        X((x_iter+1)/2:end,1,i) = 1;
        X(1,(y_iter+1)/2:end,i) = 1;
        X(end,:,i) = 1;
        X(:,end,i) = x_vals;
        X(2:x_iter-1,2:y_iter-1,i) = 0.25*(X(3:x_iter,2:y_iter-1,i-1) + X(1:x_iter- ↙
2,2:y_iter-1,i-1) + X(2:x_iter-1,3:y_iter,i-1) + X(2:x_iter-1,1:y_iter-2,i-1) - ↙
delta_x^2*f_mat(2:x_iter-1,2:y_iter-1));
        if max(abs(X(:,:,i) - X(:,:,i-1)),[],"all") <= TOL
            break
        end
    end
    X(1:(x_iter+1)/2,1:(y_iter+1)/2,end) = NaN;

    str = "";
    decide = input(str + "Press enter to exit. Type 1 for Finite Difference ↙
Solution", "s");
    switch decide
        case "1"

            % Create meshgrid for surface plot
            [X_grid, Y_grid] = meshgrid(x_vals, y_vals(1:2:end));  % Assuming x and y ↙
are 1D vectors
```

```
            figure;
            hold on
            h = surf(X_grid, Y_grid, X(:,1:2:end,end), "FaceAlpha", 0.25,↙
'FaceColor', 'b');
            xlabel('x');
            ylabel('y');
            zlabel('Temperature');
            title('2D Heat Equation Solution');
            % Fix z-axis limits to avoid recalculating each frame
            zlim([min(X(:)), max(X(:))]);
            view(3);
        case isempty(decide)
            return
    end

end
```