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Clean Up

```matlab
clear; close all; clc;
```

Prelab Questions

```matlab
%dec2bin converts the decimal numbers to binary
testSignal = 0:0.25:3.25;

[bins1, volts1] = Voltage2Bin(0, 3.3, 4, testSignal);
[bins2, volts2] = Voltage2Bin(0, 3.3, 8, testSignal);
[bins3, volts3] = Voltage2Bin(0, 3.3, 12, testSignal);
```

Plotting

```matlab
figure();
plot(testSignal, bins1, 'marker', '.', 'markersize', 20);

xlabel('Signal Voltage');
ylabel('Bin Number');
title('Bin Number vs Voltage 4 Bits');

figure();
plot(testSignal, bins2, 'marker', '.', 'markersize', 20);

xlabel('Signal Voltage');
ylabel('Bin Number');
title('Bin Number vs Voltage 8 Bits');

figure();
plot(testSignal, bins3, 'marker', '.', 'markersize', 20);

xlabel('Signal Voltage');
ylabel('Bin Number');
title('Bin Number vs Voltage 12 Bits');
```
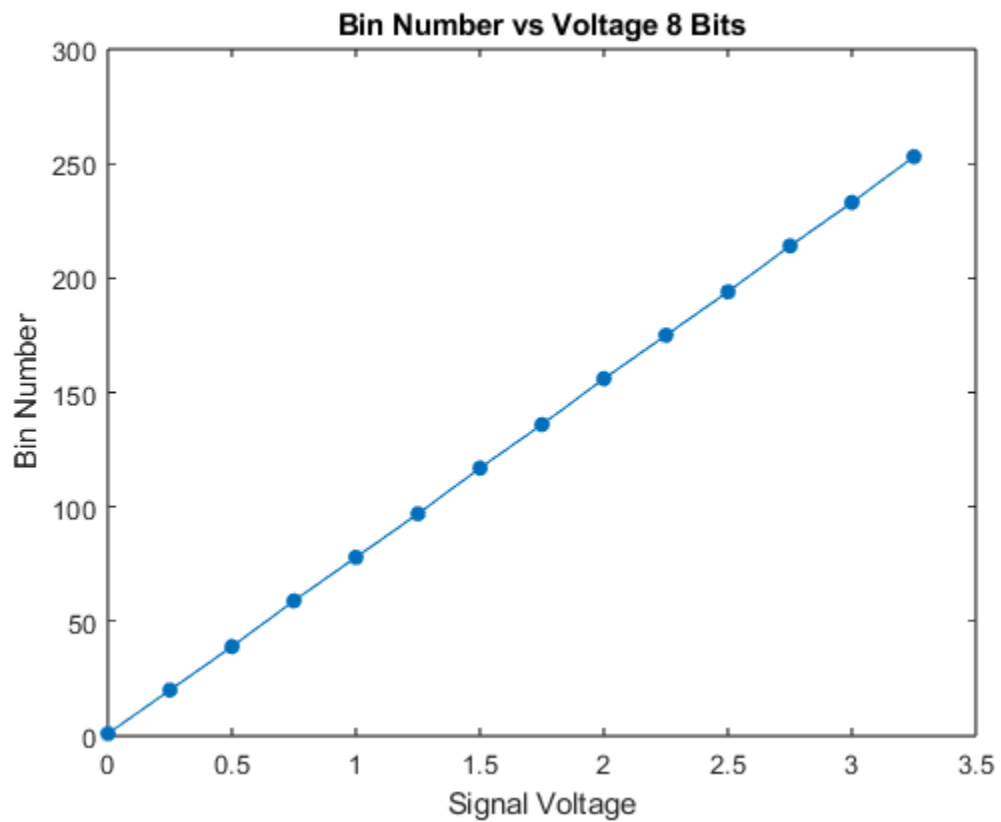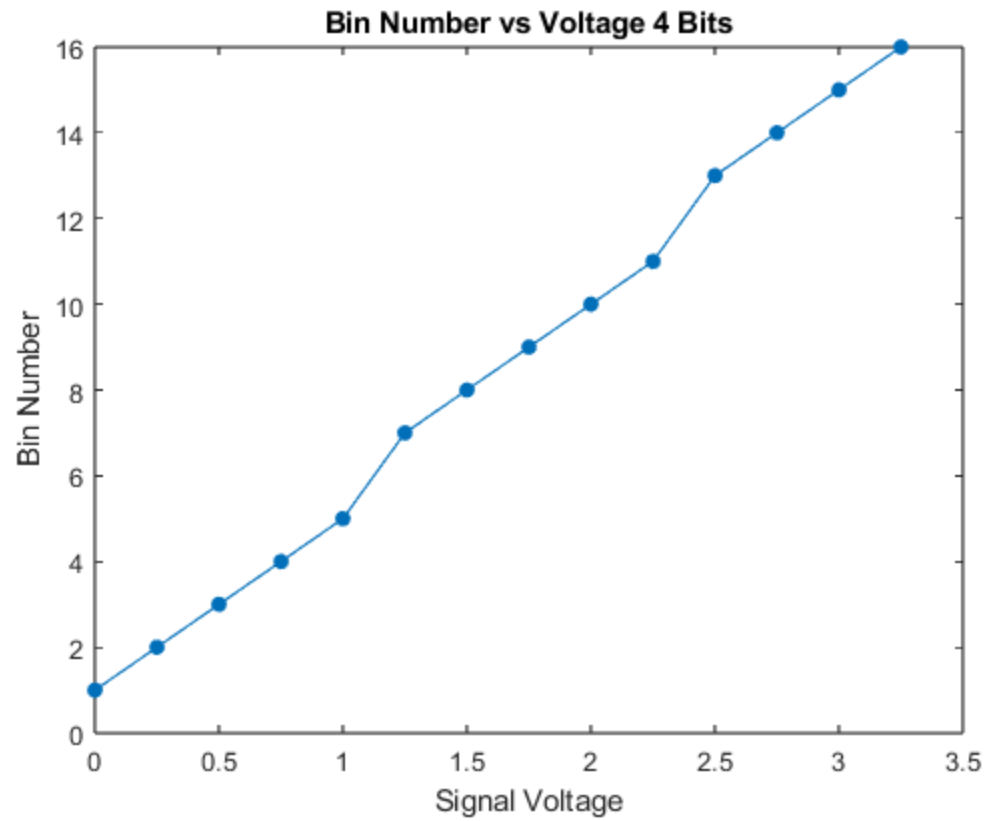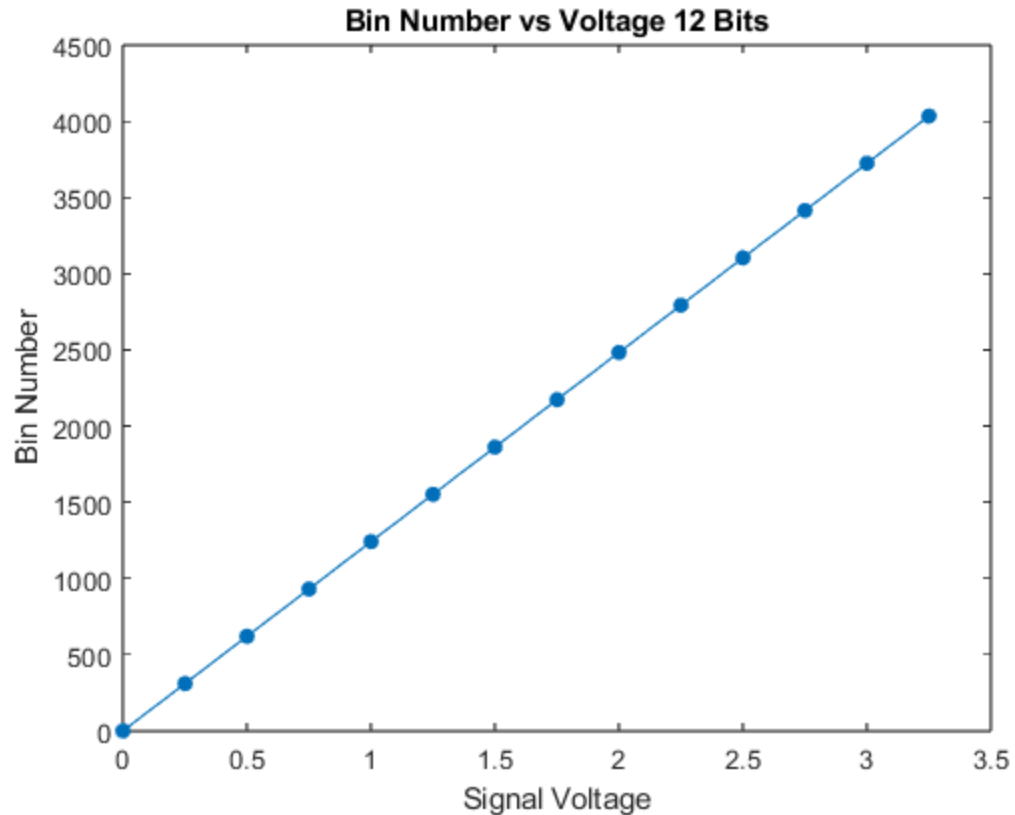
Bin Number vs Voltage 4 Bits

Bin Number vs Voltage 8 Bits

Bin Number vs Voltage 12 Bits

Functions

```
function [binNums, binVoltage] = Voltage2Bin(min_voltage, max_voltage,
numBits, signal)
    %This function determines the bin number in decimal given a
    %voltage signal
    LSB = (max_voltage - min_voltage) / 2^numBits; %Least significant
bit

    %Create an array of the bin values
    binVals = min_voltage:LSB:max_voltage;

    %Determine what bins signal is in
    binNums = zeros(length(signal),1);
    binVoltage = zeros(length(signal),1);

    for i = 1:length(signal)
        currVal = signal(i);

        %Find the closest bin value
        diffSig = currVal - binVals;
        validBins = binVals(diffSig >= 0); %Greater than 0 for bins
below the value of the signal
        [~,ind] = min(currVal - validBins); %The index where the
difference is the smallest
```

```matlab
        binNums(i) = ind; %Getting the bin number
        binVoltage(i) = binVals(ind); %Sorting the signal into the
 binned voltage
    end

end
```

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