Problem 4:

Mistake in Problem 4:

Given,

$$f(x) = 0.5x^3 - 2x^2 + 3x + 1$$

$$x = [-2, -1, 0, 1, 2]$$

Creating the table

| i | xi | f(xi) | I DD | II DD | III rd DD | IV DD |
|---|----|-------|------|-------|-----------|-------|
| 0 | -2 | -17 | 12.5 | -3.5 | 0.5 ~~+8.3333333~~ | 0 |
| 1 | -1 | -4.5 | 5.5 | -2 | | ~~0.25~~ ~~0.353333~~ 3333 |
| 2 | 0 | 1 | 1.5 | -0.5 | 0.5 | $\frac{0.5-0.5}{(2+2)} \Rightarrow 0$ |
| 3 | 1 | 2.5 | 0.5 | | | |
| 4 | 2 | 3 | | | | |

Hence,

2 degree interpolating polynomial is

$$P_2(x) = -17 + 12.5(x+2) \mp 3.5(x+2)(x+1)$$

3rd degree interpolating polynomial is

$$P_3(x) = \cancel{-17+17} \; P_2(x) + \cancel{+8.33333333} \overset{0.5}{\phantom{x}} (x+2)(x+1)(x)$$

9th degree interpolating polynomial is

$$P_a(x) = P_3(x) + \cancel{0.25} \cancel{0.3333333333} \overset{0}{\cancel{(x+2)(x+1)(x)(x-1)}}$$

$$\therefore P_4(x) = P_3(x).$$

I made a small mistake while calculating the IV DD where 0.5-0.5 becomes 0 which will cancel the whole 4<sup>th</sup> degree polynomial expression.

Looking at the graph:
The code is

```
fx = @(x)0.5*x.^3 -2*x.^2+3*x+ 1;

p2x = @(x) -17+12.5.*(x+2)-3.5.*(x+2).*(x+1);

p3x = @(x) -17+12.5.*(x+2)-3.5.*(x+2).*(x+1) + 0.5.*(x+2).*(x+1).*(x);

p4x = @(x) -17+12.5.*(x+2)-3.5.*(x+2).*(x+1) + 0.5.*(x+2).*(x+1).*(x);


xData = [-2,-1, 0,1,2];


xPlot = linspace(-2,2,100);



plot(xData, fx(xData),'*', xPlot, p2x(xPlot), 'b', xPlot, p3x(xPlot), 'r', xPlot, p4x(xPlot), 'g',xPlot,fx(xPlot),
'm');
xlabel("  Data set");
ylabel(" Function Value");
legend('Actual data point', 'p2x', 'p3x', 'p4x', 'fx');
```
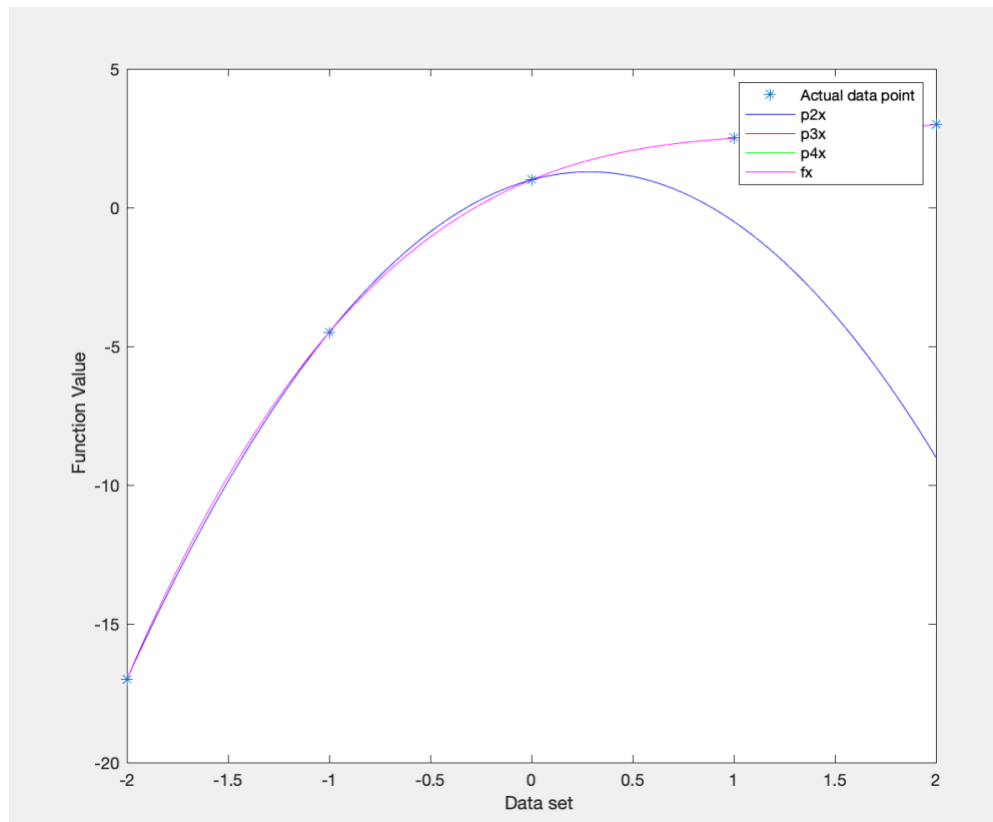
which doesn't have any fourth degree expression in p4x.

The graph:

Now, the graph looks way better than the actual submitted in the assignment.