Assignment: Homework Eleven   Name: Cody Strange
Disclaimer: This is my work, not that of others
Total Score: 40 (in points, not percentage)

Problem 1 score: 10
Problem 2 score: 10
Problem 3 score: 10
Problem 4 score: 10

```
question_one.py > ...
1    from numpy import polyfit, polyval
2    x=[0,1.8,5,6,8.2,9.2]
3    y=[2.6,16.415,5.375,3.5,2.015,2.54]
4    intPoly = polyfit(x,y,5)
5    print(intPoly)
6    print(polyval(intPoly, 3.5))
```

1.

```
PS D:\School\CS3320\HW\HW-11> & C:/Users/codyl/AppData/Local/Prog
[ 5.74407918e-03 -1.73471191e-01  1.99870979e+00 -1.04592064e+01
  2.09771368e+01  2.60000000e+00]
10.574759742842128
PS D:\School\CS3320\HW\HW-11>
```
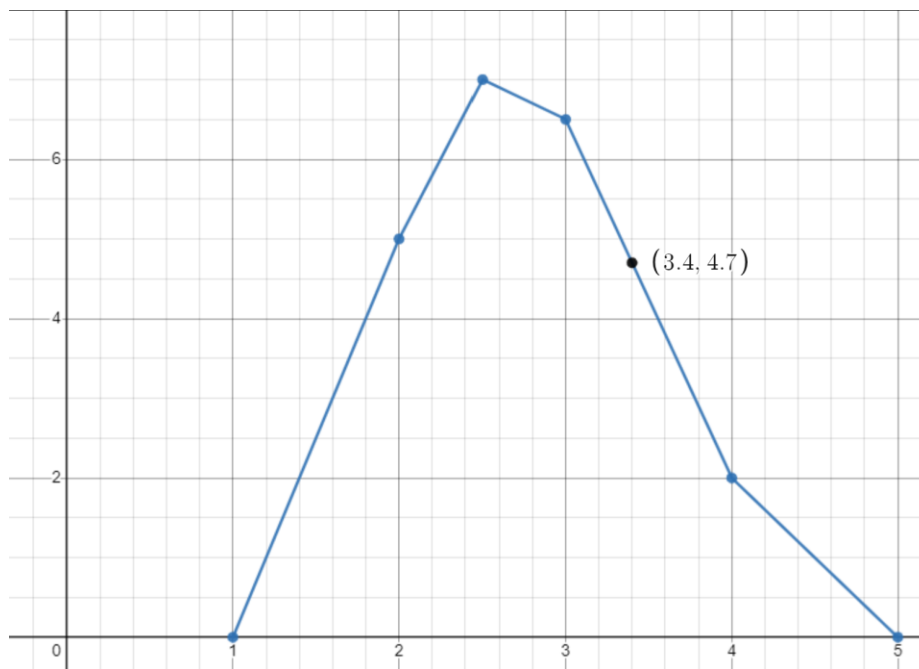
Y = 5.74407918*10^{-3} x^5 - 1.73471191*10^{-1}x^4 + 1.99780979x^3 − 1.04592064*10^{1}x^2 + 2.09771368*10^{1}x + 2.6

Y(3.5) = 10.574759742842128

2.

   a.

F(3.4) roughly equals 4.7

b.

x_0
$$(3, 6.5)$$
x_1
$$(4, 2)$$

$$f(3.4) = a_0 + a_1(3.4 - 3)$$
$$= 6.5 - 4.5(3.4 - 3)$$
$$= 6.5 - 4.5(.4)$$
$$= 6.5 - 1.8$$
$$= 4.7$$

$$\boxed{f(3.4) = 4.7}$$

F(3.4) = 4.7

$a_0 = 0$

$a_1 = f[1,2] = \dfrac{5-0}{2-1} = 5$

$a_2 = f[1,2,2.5] = \left(f[2,2.5] - f[1,2]\right)/2.5-1 = \left(\dfrac{7-5}{2.5-2} - \dfrac{5}{2}\right)/1.5 = -0.66667$

$a_3 = f[1,2,2.5,3] = f[2.5,3] - f[1,2,2.5] = \left(\dfrac{6.5-7}{3-2.5} - 1\right)/3-1 = -2.1666$

$a_4 = f[1,2,2.5,3,4] = f[3,4] - f[1,2,2.5,3] = \left(\dfrac{2-6.5}{4-3} + 1\right)/4-1 = 1.16667$

$a_5 = f[1,2,2.5,3,4,5] = f[4,5] - f[1,2,2.5,3,4] = \left(\dfrac{0-2}{5-4}\right)/5-1 = -0.2833$

c.
$$\dfrac{5}{6}$$

x	1	2	2.5	3	4	5
0	1	2	3		4	5
y=f(x)	0	5	7	4.5	2	0

$$f(x) = a_0 + a_1(x-x_0) + a_2(x-x_0)(x-x_1) + a_3(x-x_0)$$

$$f(3.4) = 0 + 5(3.4-1) + -0.666(3.4-1)(3.4-2) - 2.1666(3.4-1)(3.4-2)(3.4...$$

$$= 0 + 12 - 2.239776 - 6.5517984 + 1.41120032 + 0.205607808$$

$$= 4.82523744$$

$$(x-x_0)(x-x_1)(x-x_2) + a_4(x-x_0)(x-x_1)(x-x_2)(x-x_3) + a_5(x-x_0)(x-x_1)(x-x_2)(x-x_3)(x-x_4)$$

F(3.4) = 4.82523744

3. Order One

x	1	2	3	5	10
y=f(x)	4.75	4	5.25	19.75	36

$$f(4) = 5.25\left(\frac{4-5}{3-5}\right) + 19.75\left(\frac{4-5}{3-5}\right)$$

$$= 2.625 + 9.875$$

$$= 12.5$$

F(4) = 12.5

Order 3

	0	1	2	3
x	1	2	3	5	6
y=f(x)	4.75	4	5.25	19.75	36

$$f(x) = 4\frac{(y-3)(y-5)(x-6)}{(2-3)(2-5)(2-6)} + 5.25\frac{(y-2)(y-5)(y-6)}{(3-2)(3-5)(3-6)} + 19.75\frac{(y-2)(y-3)(y-6)}{(5-2)(5-3)(5-y)} + 36\frac{(y-2)(y-3)(y-3)}{(6-2)(6-3)(6-5)}$$

$$= -0.66667 + 3.5 + 13.16667 - 6$$

$$= 10$$

F(4) = 10

4. A.

$$S_i'(x_{i+1}) = S_{i+1}'(x_{i+1})$$

$$b_i + 2c_{i+1}(x_{i+1} - x_{i+1}) + 3d_{i+1}(x_{i+1} - x_{i+1})^2$$

$$b_i - b_{i+1} + 2C_i(\delta_i) + 3d_i(\delta)^2 = 0$$

$$S''(x_{i+1}) = S_{i+1}''(x_{i+1})$$

$$2C_i + 6d_i(x_{i+1} - x_i) = 2c_{i+1} + 6d_i \cdot f_1(x_{i+1} - x_{i+1})$$

$$\delta = x_2 - x_1 = 1, \delta_2 = 0.5, \delta_3 = 0.5, \delta_4 = 1, \delta_5 = 1.$$

$$\Delta_1 = y_2 - y_1 = 4, \Delta_2 = 2, \Delta_3 = 1, \Delta_4 = -6, \Delta_5 = -1$$
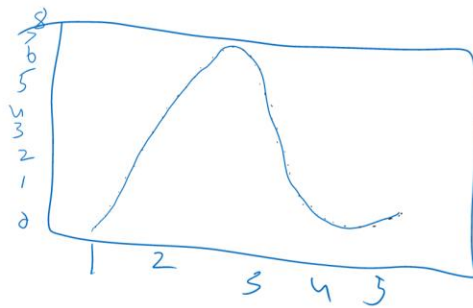
$$a_1 = y_1 = 2, a_2 = 5, a \ --$$

$a_1 = y_1 = 2, a_2 = \dfrac{7}{3} a_3 = 7, a_4 = 8, a_5 = 2$

$\dfrac{8/4}{3} = -1$

$d_i = \dfrac{C_{i+1} - C_i}{3\delta_i}$

$d_1 = 0.0290y, d_2 = -0.4044, d_3 = -6.3154, d_4 = 3.4149, d_5 = -2.08299$

$b_i = \dfrac{\Delta_i}{\delta_i} - \dfrac{\delta_i}{3}(C_{i+1} + 2C_i)$

$b_1 = 3.9710, b_2 = 4.0581, b_3 = 3.8402, b_4 = -1.4141, b_5 = -5.1660$

B1= 3.9710, b2 = 4.0581, b3 = 3.8402, b4 = -1.4191, b5 = -5.1660

B.

$$\delta_2 C_1 - (\delta_1 + \delta_2) C_2 + \delta_1 C_3 = 0$$

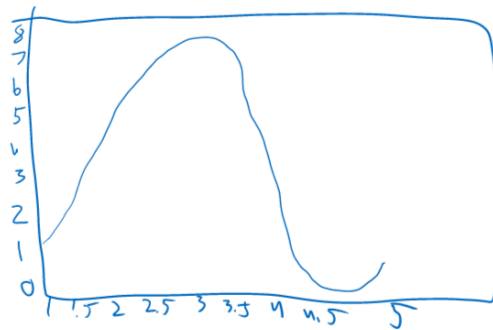$$\delta_{n-1} C_{n-2} - (\delta_{n-2} + \delta_{n-1}) C_{n-1} + \delta_{n-2} = 0$$

$$a_1 = Y_1 = 1, \ a_2 = 5, \ a_3 = 7, \ a_4 = 8, \ a_5 = 2$$

$$d_i = \frac{C_{i+1} - C_i}{3\delta_i}$$

$$d_1 = -0.38776, \ d_2 = 0.38776, \ d_3 = -3.2857 \quad d_4 = 3.7347, \ d_5 = 3.7347$$

$$b_i = \frac{\Delta_i}{\delta_i} - \frac{\delta_i}{3}(C_{i+1} + 2C_i)$$

$$b_1 = 3.4184, \ b_2 = 4.1939, \ b_3 = 3.7092, \ b_4 = -1.0306, \ b_5 = -7.2347$$

B1 = 3.4184, b2 = 4.1939, b3 = 3.7092, b4 = -1.0306, b5 = -7.2347