QUESTION-2 OUTPUTS

A-

$$f(x) = \frac{(x-1)(x-3)(x-4)(x-6)}{(-1-1)(-1-3)(-1-4)(-1-6)} \times 1 + \frac{(x+1)(x-3)(x-4)(x-6)}{(1+1)(1-3)(1-4)(1-6)} \times 3 + \frac{(x+1)(x-1)(x-4)(x-6)}{(3+1)(3-1)(3-4)(3-6)} \times 7 + \frac{(x+1)(x-1)(x-3)(x-6)}{(4+1)(4-1)(4-3)(4-6)} \times 10 + \frac{(x+1)(x-1)(x-3)(x-4)}{(6+1)(6-1)(6-3)(6-4)} \times 20$$

The outputs obtained from the calculator program written in C for the function derived through Lagrange interpolation at a random x = 3.37, using 5 points, are as follows:

```
Enter the x value that you want to calculate: 3.37

Lagrange Interpolation for first 5 points: f(3.37) = 8.004311
```

B-

$$f(x) = \frac{(x-1)(x-3)(x-4)(x-6)(x-9)}{(-1-1)(-1-3)(-1-4)(-1-6)(-1-9)} \times 1 + \frac{(x+1)(x-3)(x-4)(x-6)(x-9)}{(1+1)(1-3)(1-4)(1-6)(1-9)} \times 3 + \frac{(x+1)(x-1)(x-4)(x-6)(x-9)}{(3+1)(3-1)(3-4)(3-6)(3-9)} \times 7 + \frac{(x+1)(x-1)(x-3)(x-6)(x-9)}{(4+1)(4-1)(4-3)(4-6)(4-9)} \times 10 + \frac{(x+1)(x-1)(x-3)(x-4)(x-9)}{(6+1)(6-1)(6-3)(6-4)(6-9)} \times 20 + \frac{(x+1)(x-1)(x-3)(x-4)(x-6)}{(9+1)(9-1)(9-3)(9-4)(9-6)} \times 60$$

For the same x=3.37 , using 5 and additionally 6 points results follows:

```
Enter the x value that you want to calculate: 3.37

Lagrange Interpolation for first 5 points: f(3.37) = 8.004311
Lagrange Interpolation for all 6 points: f(3.37) = 8.009259
```

C-

```
--------------------------------------------------
Cubic Spline Coefficients:

Spline 0:
a: 1.000000
b: 0.083876
c: 0.000000
d: 0.026008

Spline 1:
a: 3.000000
b: 1.332249
c: 0.312093
d: 0.010891

Spline 2:
a: 7.000000
b: 2.711316
c: 0.377440
d: -0.088756

Spline 3:
a: 10.000000
b: 3.199928
c: 0.111171
d: 0.394432

Spline 4:
a: 20.000000
b: 8.377802
c: 2.477766
d: -0.275307

--------------------------------------------------
```

D-

For a exponential function such as f(x)=a*e^(bx) , coefficients are:

```
--------------------------------------------------
Exponential Fit Coefficients:
a: 2.509332
b: 0.345854
```

```
Enter the x value that you want to calculate: 3.37

Lagrange Interpolation for first 5 points: f(3.37) = 8.004311
Lagrange Interpolation for all 6 points: f(3.37) = 8.009259
--------------------------------------------------
Cubic Spline Coefficients:

Spline 0:
a: 1.000000
b: 0.083876
c: 0.000000
d: 0.026008

Spline 1:
a: 3.000000
b: 1.332249
c: 0.312093
d: 0.010891

Spline 2:
a: 7.000000
b: 2.711316
c: 0.377440
d: -0.088756

Spline 3:
a: 10.000000
b: 3.199928
c: 0.111171
d: 0.394432

Spline 4:
a: 20.000000
b: 8.377802
c: 2.477766
d: -0.275307

--------------------------------------------------
Exponential Fit Coefficients:
a: 2.509332
b: 0.345854
```