CSE541 Homework 4

Due Wednesday, April 23 at class time.

Notes:

- This homework is due **Wednesday**, not Friday.
- **Exam 1: Monday, April 28. Open books, open notes, calculators allowed.**

1. From census data, the approximate population of the United States was 150.7 million in 1950, 179.3 million in 1960, 203.3 million in 1970, 226.5 million in in 1980, 249.6 million in 1990.

   (a) Using Newton's interpolation polynomial for these data, find an approximate value for the population in 2000.

   (b) Then use the polynomial to estimate the population in 1920 based on these data.

   (c) What conclusion should be drawn?

2. The polynomial $p(x) = x^4 - x^3 + x^2 - x + 1$ has the following values:

x	-2	-1	0	1	2	3
$p(x)$	31	5	1	1	11	61

   Find a polynomial q that takes these values:

x	-2	-1	0	1	2	3
$p(x)$	31	5	1	1	11	20

   Your solution should make use of p.

3. It is suspected that the table

x	-2	-1	0	1	2	3
y	1	4	11	16	13	-4

   comes from a cubic polynomial. How can this be tested? Explain.

4. Give the polynomial in Lagrange's form that interpolates the following table:

x	-2	-1	0	1	2
y	2	14	4	2	2

   Show your work.

5. Give the polynomial in Newton's form that interpolates the following table:

x	-2	-1	0	1	2
y	2	14	4	2	2

   Show your work.

6. Determine whether this function is a natural cubic spline:

$$S(x) = \begin{cases} x^3 + 3x^2 + 7x - 5 & (-1 \le x \le 0) \\ -x^3 + 3x^2 + 7x - 5 & (0 \le x \le 1) \end{cases}$$