NUMERICAL ANALYSIS

Sample Test 1 **Math 4365 (Spring 2012)** **January 31, 2012**

20 points 1. Write out the cardinal functions $L_i(x)$ appropriate to the problem of interpolating the following table, and give the Lagrange form of the interpolating polynomial:

x	$\frac{1}{3}$	$\frac{1}{4}$	1
$f(x)$	2	-1	7

20 points 2. Construct a divided-difference diagram for the function f given in the following table, and write out the Newton form of the interpolating polynomial

x	1	$\frac{3}{2}$	0	2
$f(x)$	3	$\frac{13}{4}$	3	$\frac{5}{3}$

20 points 3. Write out the cardinal functions $H_i(x)$ and $\hat{H}_i(x)$ appropriate to the problem of interpolating the following table, and give the Hermite interpolating polynomial:

x	$f(x)$	$f'(x)$
0	2	1
1	1	2

20 points 4. Construct a divided-difference diagram for the function f given in the following table, and give the Hermite interpolating polynomial:

x	$f(x)$	$f'(x)$
0	2	1
1	1	2

20 points 5. Determine the parameters a, b, c, d, e, f, g, and h so that $S(x)$ is a natural cubic spline, where

$$S(x) = \begin{cases} ax^3 + bx^2 + cx + d & x \in [-1, 0] \\ ex^3 + fx^2 + gx + h & x \in [0, 1] \end{cases}$$

with interpolating conditions

$$S(-1) = 1, \quad S(0) = 2, \quad S(1) = -1$$