

Quiz #1

Due in class, Friday, July 18, 2003

Who's This New Guy

Answer all below questions. You may consult only the TA, but he has been instructed not to cooperate (but he won't lie to you). Submit all scratch paper and full, clear reasoning; this will help us give you partial credit.

1) Let  $(x_1, y_1), (x_2, y_2), \dots, (x_n, y_n)$ ,  $x_i$ 's distinct, be given, and let

$$\ell_i = \frac{(z - x_1) \cdots (z - x_{i-1})(z - x_{i+1}) \cdots (z - x_n)}{(x_i - x_1) \cdots (x_i - x_{i-1})(x_i - x_{i+1}) \cdots (x_i - x_n)},$$

for  $i = 1, 2, \dots, n$ , where  $z \in [x_1, x_n]$ . Now suppose that if

$$q(z) = s_1 \ell_1(z) + \dots + s_n \ell_n(z),$$

then

$$q(x_i) = y_i,$$

for  $i = 1, 2, \dots, n$ .

a) Find all  $s_i$ .

b) Give some significance to the  $s_i$ . This part is not meant to be hard.

c) Name one computational pitfall to consider when working with this representation. Why doesn't accuracy factor into this, as far as approximation error is concerned? Approximation error (as it pertains to polynomial interpolation) is the only kind of accuracy issue we have considered, as opposed to truncation error, which we have not really talked about. Name one merit of this method.