Homework Assignment 7
Due on Friday 11/22

Programming Problems:

1. Write a Matlab code that evaluates $P(x)$ in the Newton form for give x. Your code should take $x, \{x_i, a_i\}$ as input data, where $a_i = f[x_0, x_1, \ldots, x_i]$, and output $P_n(x)$. Here x should be assigned as an array and output an array $P(x)$. Use the algorithm listed on page 364 to compute $P(x)$.

2. Write two Matlab code that computes the coefficients of cubic spline interpolation $s(x)$ with not-a-knot boundary conditions and with clamped boundary conditions. Your code should take $\{x_i, f_i\}$ as input data and output a_i, b_i, c_i, d_i four arrays for not-a-knot boundary conditions. For clamped boundary conditions, your code should take $\{x_i, f_i\}$ and $f'(a), f'(b)$ as input data and output a_i, b_i, c_i, d_i four arrays.

Writing Problems:

Do the following exercise problems in the text book by Bradie,
Sec 5.4: 1, 2*, 3*, 4*, 9, 11, 13*
Sec 5.5: 2, 3, 11*
Sec 5.6: 5, 11*, 14*, 19*
Just turn in problems with*.

Bonus Problem:

Let $x_i = \dfrac{b-a}{2}\cos\left(\dfrac{2i+1}{2(n+1)}\pi\right) + \dfrac{a+b}{2}$ and $w(x) = \displaystyle\prod_{i=0}^{n}(x - x_i)$. Prove that

$$\frac{1}{2^n}\left(\frac{b-a}{2}\right)^{n+1} = \max_{x\in[a,b]}|w(x)| \le \max_{x\in[a,b]}|p_{n+1}(x)|$$

for any $p_{n+1} \in \tilde{\Pi}_{n+1}$