MATH 420, HW 2, SPRING 2015

Due: February 10, 2015

In this HW we shall use again the dataset consisting of the national total numbers of births in the US on each day in 2003, which can be found on the course web page as a text file births2003.txt

1. Use Lagrange polynomial interpolation to find the polynomial of degree 364 which exactly interpolates the births data y.

2. Use a least squares polynomial curve fitting model to approximate the births data with polynomials P_n of degree $n = 1, 2, 4, 12$, and 52, respectively. Find the approximation errors (error $= y - P_n$)

3. Do the polynomials found in problem 2 change as you permute the births data?

4. According to CDC data, in 2004, a total of 4,112,052 births were registered in the United States, 22,102 more than in 2003. Using this information, which of the models from problems 1 and 2 might provide best extrapolation from 2003 onto 2004? Are those extrapolations satisfactory? If not, are there some shorter periods of time that they are satisfactory for?

5. Use some other basis than polynomials (Fourier, wavelet, etc), to provide a good fit for 2003 data and extrapolate it to 2004. Is it more relaible than polynomials? If so, why?

6. Which of the models from problems 1 and 2 provide best interpolation for the case when every even day in 2003 is missing?