Quiz

1. true or false: $f(x) = x^2 + 1 \in \Pi_2$?
2. true or false: $f(x) = 2x + 1 \in \Pi_2$?
3. true or false: $f(x) = cos(x) \in \Pi_2$?
4. Given the lagrange interpolating polynomial $p_7(x)$ for $f(x)$ using points x_i, $i = 0..7$, and the error function $e(x) = |f(x) - p_7(x)|$, order these values: $e(x_0)$, $e(0.5(x_0 + x_1))$, and $e(0.5(x_3 + x_4))$, in order of lowest to highest expected value.
5. Using lagrange interpolation, what is the smallest number of interpolating points x_i that you would need to **exactly** interpolate the function $f(x) = x^3 + 2x^2 + 1$? How would you expect the error to change if you add/remove an single point?

Quiz

6. What is the value of the cardinal polynomial $L_{n,k}(x)$ at $x = x_k$?
7. The Taylor series expansion up to 5 terms is:

$$u(x+h) = u(x) + hu'(x) + \frac{h^2}{2}u''(x) + \frac{h^3}{6}u'''(x) + \frac{h^4}{24}u''''(x)$$

   What is the error (using big O notation, e.g. $O(h^9)$), if the Taylor expansion is further truncated to only 3 terms?
8. true or false: For small h, the order of the function $h^2 + 2h + 1$ is $O(h^2)$
9. Write down the forwards difference equation (if you forget the exact form, you can derive it from the Taylor series expansion given in 7)

Matlab Links

- https://uk.mathworks.com/help/matlab/getting-started-with-matlab.html
- https://uk.mathworks.com/support/learn-with-matlab-tutorials.html
- http://www.cyclismo.org/tutorial/matlab/index.html
- https://alliance.seas.upenn.edu/~cis520/wiki/index.php?n=Recitations.MatlabTutorial

Some of my sites

- https://github.com/martinjrobins/Aboria: A C++ library for particle interactions in n-dimensional space.
- https://github.com/pints-team/pints: A Python library for parameter inference using noisy time-series models.
- https://github.com/trase-cpp/trase: A C++ plotting library
- http://inpaintgimpplugin.github.io/: An inpainting plugin for the GIMP package
- https://chaste.cs.ox.ac.uk: C++ library for Cardiac electro-physiological and electro-mechanical simulations