CECS 271 MATLAB Assignment 5

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Due Date: December 4th

Exercises

For this lab it is important to define an implement a function $f(t)$ that represents the function for which Fourier coefficients are to be computed. The default for $f(t)$ is $f(t) = t^2$, but **be prepared to change $f(t)$ during the demo**.

1. Provide a script that allows the user to input i) an integer $k \geq 0$, and ii) a parameter that indicates either cosine or sine, and prints an approximation of the Fourier coefficient c_k (if cosine) or d_k (if sine). Use Simpsion's rule for the integral approximation with $n = 100$ segments. Note: use $n = 100$ segments in all subsequent exercises when approximating a Fourier coefficient.

2. Provide a script that allows the user to input an integer $n > 0$, and prints the sum-squared error that occurs when approximating $f(t)$ with $p_n(t)$, the n th-order trigonometric polynomial with respect to $f(t)$. In other words, approximate

$$\text{sse} = \int_0^{2\pi} (f(t) - p_n(t))^2 dt.$$

   using Simpson's rule with 1000 segments.

3. Provide a script that allows the user to input i) an integer $n > 0$, and ii) a positive integer $m > 0$, and then plots both $f(t)$ and $p_n(t)$ (see previous exercise) on the same axes over the interval $[0, 2\pi]$ using m evenly distributed t-values (e.g. linspace$(0, 2\pi, m)$).