APPM 4600 — HOMEWORK # 10

For all homeworks, you should use Python. **Do not use** symbolic software such as Maple or Mathematica.

1. For the function $f(x) = \sin(x)$. Determine the Padé approximations of degree 6 with

   (a) Both the numerator and denominator are cubic

   (b) The numerator is quadratic and the denominator is a fourth degree polynomial.

   (c) The numerator is a fourth degree polynomial and the denominator is quadratic.

   Compare the accuracy of these approximations with the sixth order Maclaurin polynomial by ploting the error over the interval $[0, 5]$.

2. Find the constants x_0, x_1 and c_1 so that the quadrature formula

$$\int_0^1 f(x)dx = \frac{1}{2}f(x_0) + c_1 f(x_1)$$

   has the highest possible degree of precision.