ZCE 111
Assignment 2

Q1: Series representation of functions

- Construct the series representation of a function $f(x)$ using up to N_0 terms, $\sum_{n=0}^{n=N_0} c_n\, x^n$. N_0 = 5, 10, 100
- Plot $\sum_{n=0}^{n=N_0} c_n\, x^n$ along with the generating function $f(x)$ on the same graph.
- The functions and their series representations are given in the following slides.

You should observe that as N_0 increases, the series representation converges to its generating function.

Q2: Taylor polynomial for e^x at $x = 0$

Taylor series representation for the exponential function $f(x) = e^x$ at x=0 up to order n is given by

Construct the Taylor series representation up to n = 3, 5, 10 terms. Plot $P_3(x), P_5$ and P_{10} along with the generating function $f(x) = e^x$ on the same graph. Label each plot with a legend. Plot $P_3(x)$ in red, $P_5(x)$ in blue, $P_{10}(x)$ in black, $f(x)$ in yellow (use the Help in Mathematica)

Q3: Simulating a wave pulse

Construct a code to superimpose n=10 one-dimensional sinuisoidal waves, each with an angular frequency ω_i and wave number k_i to form a wave pulse. Each angular frequency ω_i and wave number k_i differs slightly from the previous one only by a small fraction, namely,

$$\Delta\omega = |\omega_{i+1} - \omega_i| \ll \omega_i \quad \Delta k = |k_{i+1} - k_i| \ll |k_i|$$

Simulate the motion of such wave pulse Using **Manipulate[]**.

Repeat your simulation for n=50 waves. Comment on the difference in the wavepulse composed of n=50 and n=10 waves.