1.(15 pts) Consider the binomial series $(1+x)^{-3/2} = \sum_{n=0}^{\infty} \binom{-\frac{3}{2}}{n} x^n$.

Evaluate the binomial coefficient $\binom{-\frac{3}{2}}{n}$ to obtain the general form for the series in terms of factorials, double factorials, etc.

2.(15 pts) Find the disk of convergence for the complex power series $\sum_{n=0}^{\infty} \dfrac{(n!)^3 z^n}{(3n)!}$.

3.(15 pts)   Determine the equation for the set of points in the complex plane satisfying the equation $|z| + |z-i| = 2$. What is the name of the equation?

4.(15 pts) Find all of the roots of the equation $(2i-2)^{1/3}$. You can leave your answer in polar form. Sketch (or plot) the roots in the complex plane.

5.(15 pts) Evaluate the following complex function, $(-1)^{\sin i}$. You do not need to give a number, just leave the result in algebraic form.

6.(25 pts) An AC voltage source has a voltage amplitude of 8 volts. It is connected to a capacitor, an inductor, and a 1Ω resistor as shown. Assume the frequency of the source is such that $\omega L = 2\,\Omega$ and $1/(\omega C) = 6/5\,\Omega$ or $1.2\,\Omega$.
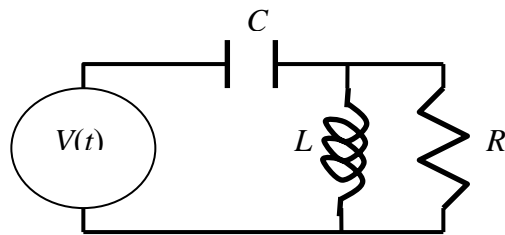
a) Find the impedance of the circuit.

b) Find the current amplitude.

c) Determine the phase angle for the circuit. Does the current lead or lag the applied voltage?

d) Determine the average power transferred to the circuit.

e) Determine the physical (not complex) voltage across the capacitor as a function of time.