

Written HW7 – MATH 3504 Spring 2021

**Due by 3 March for timely completion credit**

We will explore series solutions in this homework.

1. The so called  ${}_1F_0$  hypergeometric function with a fixed constant parameter  $a$  solves the first-order differential equation

$$(1 - t)x' - ax = 0.$$

Find the first four terms of the series solution of this differential equation. Plot them for various values of  $a$ . (*note: this could actually be solved using integrating factors, but the  ${}_0F_1$  we did in class is not so nice*)

2. The so-called Bessel function of the first kind of order 0 solves the second-order differential equation

$$t^2x'' + tx' + t^2x = 0.$$

(*note: Bessel functions famously appear as part of the solution to the wave equation (a **partial** differential equation) on a circular membrane, e.g. a drumhead, as well as many many other places*)