

Discovery Exercise for Bessel Functions



This exercise requires a computer. The problems in this exercise refer to “Bessel functions of the first kind” $J_p(x)$ and “Bessel functions of the second kind” $Y_p(x)$. Refer to your software’s documentation to find the proper syntax for entering these functions. For all the following questions, use the domain $0 \leq x \leq 50$.

1. Graph the function $J_1(x)$. Answer in words: how is $J_1(x)$ like a sine function? How does it differ from a sine function?
2. How many zeros does $J_1(x)$ have in this domain?
3. The first three positive zeros of this function are called $\alpha_{1,1}$, $\alpha_{1,2}$, and $\alpha_{1,3}$. Find their values. Your answers should be accurate to the second decimal place.
4. Find the absolute maximum of $J_1(x)$.
5. Graph the functions $J_{1.2}(x)$, $J_2(x)$, and $J_{15}(x)$. Answer in words: how are these functions alike? How do they differ?
6. Graph the function $Y_1(x)$. Answer in words: how is this function like $J_1(x)$? How is it different?