All work is to be done in a programming notebook.
Please refer to the blackboard site for commands and examples.
Submissions must be made electronically to njacob@ecok.edu.
You will be graded on the output that I am able to generate from your commands.

| A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 |

1. Let $a$ be the value corresponding to the first letter of your last (family) name. Consider the Bessel function of the first kind

$$J_a(x) = \sum_{n=0}^{\infty} \frac{(-1)^n \, x^{2n+a}}{n! \, (n+a)! \, 2^{2n+a}}$$

   (a) Find the interval of convergence.

   (b) Graph the partial sums for $0 \leq n \leq b$ for $0 \leq x \leq 10$. Where $b$ is 1, 10, and 50.

   (c) Graph the partial sums and the full function using the besselj(a,x) command all on the same coordinate axis.

   (d) Explain in words how well the partial sums approximate the full function.

2. Consider the Lissajous figure. Use $a$ as defined above and $b$ as the initial of your first name. Your $t$ should vary between zero and $2\pi$.

$$\begin{cases} x = a \sin 3t \\ y = b \cos t \end{cases}$$

   (a) Use plot_parametric command graph the curve.

   (b) Find the equation of the tangent when $t = \frac{\pi}{12}$. Graph it together with the curve.

   (c) Find the area under the curve.

   (d) Find the arc length of the curve.