Assignment 02: Vectors and Shortcuts

1. Create the following vectors using the : operator:

$$u = \begin{bmatrix} -5 & -2 & 1 & 4 & 7 \end{bmatrix}$$

$$v = \begin{bmatrix} -\pi \\ -\frac{\pi}{2} \\ 0 \\ \frac{\pi}{2} \\ \pi \end{bmatrix}$$

2. Create a variable n and assign it the value 10! using the `prod()` command.
3. Create the following matrices:

$$A = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \end{bmatrix}$$

$$B = \begin{bmatrix} 12 & 6 & 9 & 3 \\ 11 & 5 & 8 & 2 \\ 10 & 4 & 7 & 1 \end{bmatrix}$$

Hint: Generate half of this matrix using `reshape()` then use it to generate the other half. Across both matrices, you now have all of the columns you need to generate B using assignment 1 methods.

4. We can represent a square wave with the following approximation:

$$a_n = 2n + 1 \qquad s(t) = \sum_{n=0}^{\infty} \frac{sin(a_n t)}{a_n}$$

(i) Generate a row vector containing time stamps from t = -π to t = π using linspace.
(ii) Generate a column vector containing a_n's for n between 0 and 50.
(iii) Use broadcasting to generate a matrix with the $\frac{sin(a_n t)}{a_n}$ terms.
(iv) Use the `sum()` command to generate values for the square wave.
(v) Suppose your timestamps are stored in a vector `t` and your square wave values are stored in a vector s. You should be able to generate a plot of your square wave using the command `plot(t, s)`. Don't worry about making this plot look nice right now, we will learn how to do that soon.