

Matrix Homework 2

Due: November 29, 2023

Name:

1. Gram-Schmidt Orthogonalization.

- (a) (10 points) Use Gram-Schmidt Orthogonalization to orthogonalize the following matrix A by hand. Show your work on all parts.

$$A = \begin{bmatrix} -3 & -1 \\ 1 & 2 \end{bmatrix}$$

- (b) (5 points) Show that Q is orthogonal by computing $Q^T Q$
- (c) (10 points) Find the QR factorization of matrix A .
- (d) (5 points) Show that $QR = A$ by multiplying Q by R .
2. (10 points) Write a script in Matlab that does Gram-Schmidt Orthogonalization on a matrix. Submit your Matlab file on Sakai.
3. (10 points) In Matlab, create a square wave:

```
t = linspace(-8*pi, 8*pi, 1000);  
s = square(t);
```

Compute its frequency spectrum using the `fft()` function. Lowpass filter your square wave by zeroing out some of the higher frequency components in the frequency domain using a similar technique to what we did in the filtering lab. Convert back to the time domain using the `ifft()` function:

```
freq = fft(s);
```

```
% Filter in the frequency domain by zeroing out some elements of freq
```

```
filt = real(ifft(freq));  
plot(t,filt);
```

Turn in your code and a plot of the filtered square wave.