Give complete solutions to the following problems. Be sure to provide all the necessary steps to support your answers.

1.   Use the Gram-Schmidt process to find an orthonormal basis for **W**.

a. $W = span\{(1,0,-1),(2,-2,3)\}$

b. $W = span\{(-1,3,1,1),(6,-8,2,-4),(6,3,6,-3)\}$

2.   Let $\mathbf{A} = \begin{bmatrix} 2 & 4 \\ -1 & -1 \\ 5 & 2 \end{bmatrix}$

a.   find an orthogonal basis for the column space matrix **A**, then use it to construct an orthogonal matrix **Q**.

b.   Show that the column space of **A** equals the column space of **Q**

c.   find an invertible matrix **R** such that **A=QR**.

d.   verify that **A=QR**.

3.   Repeat problem 2 with $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 1 & 0 \end{bmatrix}$