Math 2114 Homework 1 Spring 2018

Follow **Homework requirements found on my website**. Put work on separate sheet of paper.

Problem 1: Given vectors $v = \begin{bmatrix} 2 \\ 3 \end{bmatrix}, w = \begin{bmatrix} 5 \\ 1 \end{bmatrix}$, find 1) v + w, 2) v – w, and 3) 2v + w. Sketch the Parallelogram Rule that illustrates the results each operation.

Problem 2:
Use Theorem 1.1 to justify each step given below to prove that $u-(3u+v)+2v+2u=v$
For vectors u and v in R^n. (**you may put your answers on this sheet for this problem**)

Proof: Consider the following:

$u-(3u+v)+2v+2u=$	_____given__________
$u+(-1)(3u+v)+2v+2u=$	__ definition of scalar __
$u+(-3)u+(-1)v+2v+2u=$	______________________
$(-3)u+(-1)v+2v+2u+u=$	______________________
$-3u+(-v+2v)+(2u+u)=$	______________________
$-3u+(v)+(3u)=$	______________________
$v+(3u)+(-3u)=$	______________________
$v+0=$	______________________
v	______________________

Problem 3: Given the vectors $v_1 = \begin{bmatrix} 1 \\ -2 \\ 0 \end{bmatrix}, v_2 = \begin{bmatrix} -1 \\ 1 \\ 3 \end{bmatrix}, v_3 = \begin{bmatrix} 0 \\ -6 \\ 2 \end{bmatrix}$,

a) Find the dot product $v_1 \bullet v_2$.
b) Find the norm $\|v_3\|$.
c) Find the unit vector associated with v_3.
d) Find the linear combination $u = 2v_1 - 4v_2 + 3v_3$
e) Verify that $\|v_1+v_2\| < \|v_1\| + \|v_2\|$ when $v_1 \bullet v_2 \neq 0$ (Explain why.)
   This problem is based on the Cauchy-Schwarz Inequality and the Triangle Inequality Found on page 22 and 23 in Poole.
f) Verify that v_2 is orthogonal to v_3.
g) Find the angle θ between v_1 and v_2 using $\cos\theta = \dfrac{v_1 \bullet v_2}{\|v_1\|\|v_2\|}$