Last name: *First name:*

Recommended problems - *Please do NOT turn these in*:

- §3.1: 5, 7, 9, 13, 21
- §3.2: 3ac, 5a, 7, 9

Submitted problems:

(1) Consider the vectors

$$\mathbf{u} = (3, -2, 0), \quad \mathbf{v} = (1, -1, -2), \quad \mathbf{w} = (0, 1, 1, -3).$$

Evaluate the expressions if possible. If not, explain why the expression cannot be evaluated.

(a) $3(\mathbf{u} - 2\mathbf{v})$
(b) $\|\mathbf{u}\| + \mathbf{v}$
(c) $\|\mathbf{w}\| + \| - 2\mathbf{u}\|$
(d) $\|\mathbf{v} + \mathbf{w}\|$
(e) $\|\mathbf{u}\|\mathbf{w}$

(2) Find all scalars c_1, c_2 and c_3 such that

$$c_1(1, 2, 0) + c_2(2, 1, 1) + c_3(0, 3, 1) = (0, 0, 0)$$

(3) Prove that there exist scalars c_1, c_2 and c_3 such that

$$c_1(1, 2, 0) + c_2(2, 1, 1) + c_3(0, 3, 1) = (a, b, c)$$

for any given vector (a, b, c).

(4) Indicate whether the statement is always true or sometimes false. Justtify your answer with a logical argument or a counter-example. Assuming that $\mathbf{u}$, $\mathbf{v}$ and $\mathbf{w}$ are vectors in $\mathbb{R}^n$.

(a) If $\mathbf{u} + \mathbf{v} = \mathbf{u} + \mathbf{w}$, then $\mathbf{v} = \mathbf{w}$.
(b) $\|\mathbf{u} + \mathbf{v}\| = \|\mathbf{u}\| + \|\mathbf{v}\|$.

(5) Show that if $\mathbf{u} \neq \mathbf{0}$ then $\dfrac{1}{\|\mathbf{u}\|}\mathbf{u}$ has length one. What if $\mathbf{u} = \mathbf{0}$?