

*University of Lethbridge*  
Department of Mathematics and Computer Science  
**MATH 1410 - Tutorial #3**  
Wednesday, January 31

Please answer the problems on the back of this page to the best of your ability. You are encouraged to use scrap paper to do calculations and organize your work, but all work to be graded must be done on this worksheet.

Additional practice: (**do not submit**).

1. Given  $\vec{v} = \langle 3, -4, 1 \rangle$  and  $\vec{w} = \langle -2, 1, 5 \rangle$ , compute:

(a)  $4\vec{v} - 3\vec{w}$

(b) The vector  $\vec{x}$  such that  $-3\vec{v} + 5\vec{x} = 2\vec{w}$

(c)  $\vec{v} \cdot (3\vec{w})$ ,  $(3\vec{v}) \cdot \vec{w}$ , and  $3(\vec{v} \cdot \vec{w})$

(d)  $\text{proj}_{\vec{v}} \vec{w}$  and  $\text{proj}_{\vec{w}} \vec{v}$

(e) Vectors  $\vec{w}_{\parallel}$  and  $\vec{w}_{\perp}$  such that  $\vec{w}_{\parallel}$  is parallel to  $\vec{v}$ ,  $\vec{w}_{\perp}$  is orthogonal to  $\vec{v}$ , and  $\vec{w}_{\parallel} + \vec{w}_{\perp} = \vec{w}$ .

1. Let  $\vec{v} = \langle 4, 3 \rangle$  and  $\vec{w} = \langle 2, 3 \rangle$ .
  - (a) Compute  $\text{proj}_{\vec{v}} \vec{w}$  and  $\text{proj}_{\vec{w}} \vec{v}$ .
  - (b) Sketch  $\vec{v}$ ,  $\vec{w}$ ,  $\text{proj}_{\vec{v}} \vec{w}$ , and  $\text{proj}_{\vec{w}} \vec{v}$  on one set of coordinate axes.

2. Show that for **any** vectors  $\vec{u}$ ,  $\vec{v}$ , and  $\vec{w}$  in  $\mathbb{R}^2$ ,

$$\vec{u} \cdot (\vec{v} + \vec{w}) = \vec{u} \cdot \vec{v} + \vec{u} \cdot \vec{w}.$$

Then, illustrate the result with an example.