February 6th, 2018

Math 241

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Spring 2018

Name: .....

Student ID (last 6 digits): XXX- .....

Midterm 1

Version A

You have 50 minutes to complete the exam. Do all work on this exam, i.e., on the page of the respective assignment. Indicate clearly, when you continue your solution on the back of the page or another part of the exam.

Write your name and the last six digits of your student ID number on the top of this page. Check that no pages of your exam are missing. This exam has 8 questions and 10 printed pages (including this one and a page for scratch work in the end).

No books or notes are allowed on this exam!

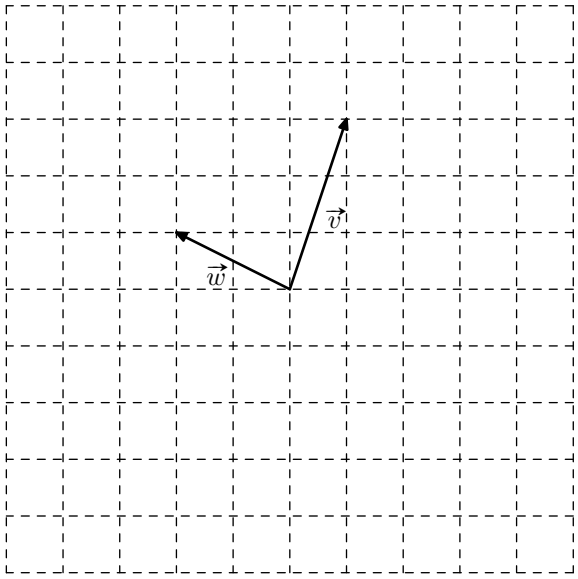
Show all work! (Unless I say otherwise.) Correct answers without work will receive **zero**. Also, **points will be taken from messy solutions**.

Good luck!

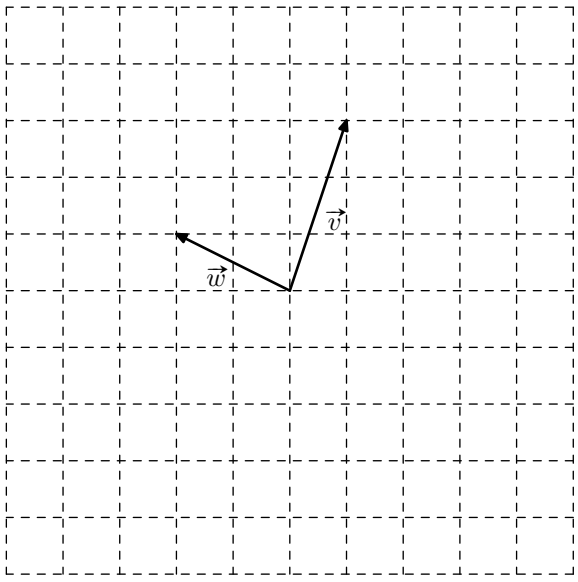
Question	Max. Points	Score
1	15	
2	10	
3	15	
4	10	
5	10	
6	15	
7	10	
8	15	
Total	100	

1) Vectors: I will use $\vec{v}$ for the vectors [as in class] instead of **v** [as in the book].

(a) [7 points] Draw the sum of the vectors $\vec{v}$ and $\vec{w}$ in the grid below.



(b) [8 points] Draw the $\vec{v} - 2\vec{w}$ in the grid below.



2) [10 points] Give the vector parametrization of the line passing through the points $P = (1, 0, -1)$ and $Q = (2, 2, 1)$.

3) [15 points] Let $\vec{v} = \langle 1, -2, 0 \rangle$ and $\vec{w} = \langle 1, 1, 1 \rangle$. Compute $\vec{v}_{\parallel \vec{w}}$ [the projection of $\vec{v}$ along $\vec{w}$] and $\vec{v}_{\perp \vec{w}}$ [the orthogonal component of $\vec{v}$ with respect to $\vec{w}$].

4) [10 points] Give the equation of the plane determined by $P = (0, 0, 3)$, $Q = (1, -1, -1)$, and $R = (1, -2, 0)$.

5) [10 points] Determine if the line given by $\vec{r}(t) = \langle 2 - t, 1 + 2t, 0 \rangle$ and the plane given by $2x - y - 3z = 5$ are either parallel, perpendicular, or neither. [For the sake of simplicity, we assume that a line on the plane is parallel to the plane.]

6) [15 points] Find the intersection of the planes $x - y + 2z = 3$ and $2x - z = 1$.

7) [10 points] What is the volume of the parallelepipede determined by the vectors $\vec{u} = \langle 1, 0, 2 \rangle$, $\vec{v} = \langle 0, 2, 1 \rangle$, and $\vec{w} = \langle 1, -1, 0 \rangle$?

8) [15 points] Give the cylindrical and spherical coordinates of the point $(x, y, z) = (3/2, \sqrt{3}/2, 1)$.

Scratch: