Due Wednesday, September 18^{th} Problem Set # 3

Math-215 Fall 2019

Please box your answers for each of the exercises below. Also, be mindful of your presentation, I will deduct 10 points for disorganized or unintelligible answers.

Chapter: Vectors (# 10.2)

Ungraded, warm up and suggested exercises.

- Find a unit vector with the same direction as $\vec{v} = \langle -2, 4 \rangle$.
- Find a vector that has the same direction as $\langle -6, 3 \rangle$ but has length 6.

Exercises 96/100 (12 points each)

1) Section 10.2, problems: # 1, 2, and 4. Do them all.
2) Section 10.2, problems: # 5 - 8.
3) Section 10.2, problems: # 9 - 12.
4) Section 10.2, problems: # 13 and 14; in the book's notation $|\mathbf{a}| = ||\vec{a}||$ is the norm of the vector $\vec{a}$.
5) Section 10.3, problems: # 1, 2, 3, 6, and 9.
6) Section 10.3, problems: # 11 - 13.
7) Section 10.3, problems: # 19[1].
8) Show that $\vec{A} \cdot (\vec{A} \times \vec{B}) = \vec{0}$ and $\vec{B} \cdot (\vec{A} \times \vec{B}) = \vec{0}$ for all $\vec{A} = \langle a_1, a_2, a_3 \rangle$ and $\vec{B} = \langle b_1, b_2, b_3 \rangle$.

More difficult problems 4/100 (2 points each). *Please submit these on a separate sheet*.

9) Section 10.2, problems: # 33.
10) The vectors $\hat{\imath} = \langle 1, 0 \rangle$ and $\hat{\jmath} = \langle 0, 1 \rangle$ are not the only basis vectors that can be used. In fact, Any two nonzero and nonparallel vectors can be used as basis vectors for two-dimensional space. To see this, define $\vec{a} = \langle 1, 1 \rangle$ and $\vec{b} = \langle 1, -1 \rangle$. To write the vector $\vec{v} = \langle 5, 1 \rangle$ in terms of these vectors, we want constants c_1 and c_2 such that $\langle 5, 1 \rangle = c_1\vec{a} + c_2\vec{b}$. Show that this requires that $c_1 + c_2 = 5$ and $c_1 - c_2 = 1$, and then solve for c_1 and c_2. Show that any vector $\langle x, y \rangle$ can be represented uniquely in terms of $\vec{a}$ and $\vec{b}$. Determine as completely as possible the set of all vectors $\vec{v}$ such that $\vec{a}$ and $\vec{v}$ form a basis.