Problem Set #1
Due Thursday, August 21

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Problem 1.1.1. Determine whether the vectors emanating from the origin and terminating at the following pairs of points are parallel.

(a) $(3, 1, 2)$ and $(6, 4, 2)$

(b) $(-3, 1, 7)$ and $(9, -3, -21)$

(c) $(5, -6, 7)$ and $(-5, 6, -7)$

(d) $(2, 0, -5)$ and $(5, 0, -2)$

Problem 1.1.2. Find the equations of the lines through the following pairs of points in space.

(a) $(3, -2, 4)$ and $(-5, 7, 1)$

Problem 1.1.3. Find the equations of the plane containing the following points in space.

(a) $(2, -5, -1)$, $(0, 4, 6)$, and $(-3, 7, 1)$

Problem 1.1.6. Show that the midpoint of the line segment joining the points (a, b) and (c, d) is $((a + c)/2, (b + d)/2)$.

Problem 1.2.10. Let V denote the set of all differentiable real-valued functions defined on the real line. Prove that V is a vector space with the operations of addition and scalar multiplication defined in Example 3.

Problem 1.2.12. A real-valued function f defined on the real line is called an **even function** if $f(-t) = f(t)$ for each real number t. Prove that the set of even functions defined on the real line with the operations of addition and scalar multiplication defined in Example 3 is a vector space.

Problem 1.2.14. Let $V = \{(a_1, a_2, \ldots, a_n) : a_i \in \mathbb{C} \text{ for } 1 \leq i \leq n\}$. So V is a vector space over $\mathbb{C}$ by Example 1. Is V a vector space over the field of real numbers with the operations of coordinatewise addition and multiplication?

Problem 1.2.22. How many matrices are there in the vector space $M_{m\times n}(\mathbb{Z}_2)$? (See Appendix C.)