Math 2153 - Spring 2017 Name: _____

Quiz 1 - Take Home (10 pts) Recitation Time: _____

SHOW ALL WORK!!! Unsupported answers might not receive full credit.

Problem 1 [2 pts] A model airplane is flying horizontally due north at 30 mi/hr when it encounters a horizontal crosswind blowing east at 20 mi/hr and an updraft blowing vertically upward at 15 mi/hr. Find the position vector that represents the velocity of the plane relative to the ground, and find the speed of the plane relative to the ground.

Problem 2 [3 pts] Consider the points $A(5, 5, 2)$, $B(9, 11, 4)$, and $C(3, 2, 1)$. Use the cross product to determine whether the three points are colinear and explain how you know this from your answer. (Hint: How are colinearity and "parallelness" related?)

Problem 3 [5 pts] Consider the point $P(-5, 7)$ and the line ℓ given by $y = 5x$.

(a). [0.5 pts] Find any vector $\mathbf{v}$ in the direction of ℓ.

(b). [0.5 pts] Find the position vector $\mathbf{u}$ corresponding to P.

(c). [1 pt] Find $\text{proj}_{\mathbf{v}}\mathbf{u}$.

(d). [1 pt] Show that $\mathbf{w} = \mathbf{u} - \text{proj}_{\mathbf{v}}\mathbf{u}$ is perpendicular to $\mathbf{v}$.

(e). [2 pts] Use a picture with the above 4 vectors and a fact about side lengths in right triangles to explain why $|\mathbf{w}|$ is the least distance between P and ℓ.