Dawson College: **Linear Algebra** (SCIENCE): 201-NYC-05-S1: Winter 2024: **Quiz 12** name: ____________________

Books, watches, notes or cell phones are **not** allowed. The **only** calculators allowed are the Sharp EL-531**. You **must** show all your work, the correct answer is worth 1 mark the remaining marks are given for the work.

Question 1. *(3 marks)* Determine whether the set V of all functions $f:\mathbb{R}\to\mathbb{R}$ with addition $(f+g)(x)=f(x)+g(x)$ and scalar multiplication $(af)(x)=f(ax)$ is a vector space.

Question 2. *(3 marks)* Show that the $\mathbf{0}$ in any vector space is unique. *Show every step, justify every step, and cite the axiom(s) used!!!*

Question 3.[1] Let $V=\{(a,b)\mid a,b\in\mathbb{R}, b>0\}$. And the addition in V is defined by $(a,b)\bigoplus(c,d)=(ad+bc,bd)$ and scalar multiplication in V is defined by $t\bigodot(a,b)=(tab^{t-1},b^t)$

a. *(2 marks)* If V is a vector space find the zero vector of the vector space.

b. *(3 marks)* Demonstrate whether the 3rd axiom of vector spaces holds. That is, vector addition is associative.

[1] From http://www.math.uwaterloo.ca/ jmckinno/Math225/Week1/Lecture1e.pdf