Economics 701A **Steven A. Matthews**
Fall 2014 **University of Pennsylvania**

Quiz

20 points, 30 minutes. Closed books, notes, calculators.
Indicate your reasoning, using clearly written words as well as math.

1. Consider a C^1 strictly quasiconcave utility function $u : \mathbb{R}^n_+ \to \mathbb{R}$ that has positive partial derivatives everywhere. Suppose it gives rise to a differentiable demand function $x(p, m)$, and assume the indirect utility function $v(p, m)$ is homogeneous of degree 1 in m.

   (a) (2 pts) Define what it means for an arbitrary function $f : \mathbb{R}^k_+ \to \mathbb{R}$ to be homogeneous of degree 1.

   (b) (5 pts) Prove that $x(p, m)$ is homogeneous of degree 1 in m.

   (c) (5 pts) Using (b), prove that for any $(p, m) \in \mathbb{R}^{n+1}_{++}$,

   $$u(tx(p, m)) = tu(x(p, m)).$$

   (d) (8 pts) Using (c) and the supporting hyperplane theorem, conclude that u is homogeneous of degree 1.