Read all question carefully and write clearly!

Name:_

1. (4pts) Define, in full detail, what a basis of the vector space \mathbb{R}^n is.

- 2. (2pts) For each function, write whether it is: onto, one-to-one, both, or neither:
 - (a) $f(x) = x^3$
 - (b) $f(x) = \cos(x)$
 - (c) $f(x) = e^x$
 - (d) $f(x) = \tan(x)$
- 3. (6pts) Fill in the blank with the most correct word that is in the word bank:

span, one-to-one, null space, Mr. T, dimension, subspace, linear transformation, trivial solution homeomorphism, linearly independent, linearly dependent, rank, column space, nilpotence

 $\label{eq:quasibarreled} \ensuremath{\mathsf{Philadelphia}}, \ensuremath{\mathsf{basis}}, \ensuremath{\mathsf{row}} \ensuremath{\mathsf{space}}, \ensuremath{\mathsf{chomology}}, \ensuremath{\mathsf{plurisubarmonic}}, \ensuremath{\mathsf{over-constrained}}$

- (a) The ______ of a linear map, T, is the set of all vectors \vec{x} such that $T(\vec{x}) = \vec{0}$
- (b) The number of pivot columns of a row reduced matrix A is the ______ of A.
- (c) Given a set of vectors $\vec{v}_1, \ldots, \vec{v}_n$ with the property that $\sum_{i=1}^n a_i \vec{v}_i = 0$ implies that $a_1 = a_2 = \cdots = a_n = 0$, then we say that the vectors are ______.
- (d) Given a matrix A (which is an example of a _____), let the collection, S, be all vectors \vec{b} , such that $\vec{b} = A\vec{x}$ as we vary \vec{x} over all vectors in the domain of A. Then S is the ______ of A.
- (e) The set of all linear combinations of a collection of vectors is called the ______ of those vectors.
- (f) (0 pts) The _____ Eagles are a NFL team that are about to lose to the Green Bay Packers.