TPHS Linear Algebra — SDSU Math 254 Name: _____

Quiz #4 (5.1 - 5.6) **Part I** _____ Per.: _____

Scientific calculator allowed. 30 pts.

This section is "open notebook." Clearly show *all* work.

1) Do problem 20a in section 5.3. (3 points)

2) Define *row space*. (2 points)

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Quiz #4 (5.1 - 5.6) **Part II** Per.: _____

Scientific calculator allowed. ***This section is "closed notebook."***

Clearly show *all* work. Simplify and circle your answers.

1) List the missing axioms (by formula *or* description) that must hold for a set *V*, with elements **u** and **v**, to be a vector space. (1 point each - order does *not* matter.)

a) Closure under vector addition

b) Additive Inverse

c) Additive Identity

d) Distributive Axiom - Vector over scalar addition

e) Distributive Axiom - Scalar over vector addition

f) _____

g) _____

h) _____

i) _____

j) _____

2) Let *U* be the set of all vectors with the form **u** = (-*u*, *u*, -*u*). Prove that *U* is a subspace of $\mathbb{R}^3$. (2 points)

3) *S* = {(1, 1, 1), (1, -1, 1), (0, 0, 1)} Prove that *S* is a linearly independent set. (2 points)

4) Define *basis*. (2 points)

5) Prove that the set *S* from #3
S = {(1, 1, 1), (1, -1, 1), (0, 0, 1)}
is a basis for $\mathbb{R}^3$. (2 points)

6) $\mathbf{v}_1$ = <-1, 1> and $\mathbf{v}_2$ = <6, 3> form a basis for $\mathbb{R}^2$.

Find the coordinate vector of <6, 0> relative to the basis above. (2 points)

Let $A = \begin{bmatrix} 1 & 2 & -2 & 1 \\ 3 & 6 & -5 & 4 \\ 1 & 2 & 0 & 3 \end{bmatrix}$

Note that the reduced row-echelon form of A is

$$\begin{bmatrix} 1 & 2 & 0 & 3 \\ 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

7) Find a basis for the column space of A. (2 points)

8) Find a basis for the nullspace of A. (2 points)

9) Check that your results make sense by comparing the rank, nullity, and size of A. (2 point)

10) Let A be an $n \times n$ matrix with $\det(A) = 0$. True or False? (1 point each)

a) nullity(A) = 0 _____

b) The row vectors of A form a linearly dependent set _____

c) The row vectors of A span $\mathbb{R}^n$. _____

d) A is nonsingular _____