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| Assessment 6Dusty Wilson Math 220No work = no credit | **Name**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*As for everything else, so for a mathematical theory: beauty can be perceived but not explained.*Arthur Cayley1821 - 1895 (English mathematician) |

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| Warm-ups (1 pt each):Note: Assume | =\_\_\_\_\_ | =\_\_\_\_\_ |  =\_\_\_\_\_ |

(1 pt) The quote above is by Cayley who was one of the founders of linear algebra. According to Cayley, how do we explain beauty in mathematics? Answer using complete English sentences.

(5 pts) Let  and  are bases for . Find the change-of-coordinates matrix from *B* to *C* **and** the change-of-coordinates matrix from *C* to *B*. Please clearly indicate which is which.

(5 pts) In , find the change-of-coordinates matrix from the basis  to the standard basis. Then write  as a linear combination of the polynomials in *B*.

(3 pts) Consider . Find the rank of *A* and the dimension of the null space of *A* What is their sum?

(2 pts) If *A* is a 20 x 23 matrix with a 5-dimensional null space, what is the rank of *A*? Why?

(5 pts) Prove the Basis Theorem which states that if *V* is a *p*-dimensional vector space,  then: Any linearly independent set of exactly *p* elements in *V* is automatically a basis for *V*. And, any set of exactly *p* elements that spans *V* is automatically a basis for *V*.