**Problem**

Consider the matrix A=



Calculate the sum of A’s rank and the dimension of the null space of A.

**Solution**

To determine the rank of matrix A, we can use row reduction (Gaussian elimination) to put the matrix into row-echelon form.

Performing row operations:

Results in:

A



Now, the matrix is in row-echelon form. We see that the first row is non-zero, so the rank of matrix A is 1.

To find the dimension of the null space of A, we need to solve the homogeneous system of linear equations represented by the matrix equation Ax=0.

Ax=0



Using the row-echelon form of A, we have:

The system only has one independent equation. We can choose ​=*t* and =*s*, where *t* and *s* are parameters. Then, =−2*t*−3*s*.

So, the general solution is:

x=*t* + *s*



The dimension of the null space (also known as the kernel) of A is 2, since there are two free parameters *t* and *s*.

The rank of matrix A is 1.

The dimension of the null space of A is 2.

The sum of the two is: 1+2 = **3**.

**Answer: 3**