# Max Kramer

I affirm that I have adhered to the honor code on this assignment.

*Hello again, scientist! I'll write in italics, and problems for you will always be in **bold**. As a general rule, I expect you to do at least as much writing as I do. Code should be part of your solution, but I expect variables to be clear and explanation to involve complete sentences. Cite your sources; if you work with someone in the class on a problem, that's an extremely important source.*

# Problem 2.2.

*Unfortunately, MATLAB is often extremely bad at working with symbolic variables. Consider the following matrix.*

```
syms a;
A = [1 a; a a+2]
rref(A)


A =

[ 1,     a]
[ a, a + 2]


ans =

[ 1, 0]
[ 0, 1]
```

**Based on the above result, how many pivots does A have?**

Based on the above results, A appears to have 2 pivots as the row reduced form of A contains two pivots.

**Why does this prove that the above answer is wrong?**

```
B=subs(A,a,2)
rref(B)


B =

[ 1, 2]
[ 2, 4]


ans =

[ 1, 2]
[ 0, 0]
```

By substituting in a value for a in the matrix A, the row reduced form of B only contains 1 pivot.

*Okay fine, I'll just row-reduce it by hand.*

```
C = A;
C(2,:) = C(2,:) - a*C(1,:)


C =

[ 1,               a]
[ 0, - a^2 + a + 2]
```

***Explain what I just did. Then use the output to give a better answer to the question: how many pivots does A have?*** *(Your answer will depend on a.)*

The first step was copying the matrix A to a new matrix C. Then, a row operation was performed in which the 2nd row was replaced by itself plus -a * the 1st row. If a value for a is selected that results in -a^2+a +2 is zero (a=2,a=-1), then there is only one pivot. If an a is selected that causes -a^2+a+2 to be nonzero, than the matrix A has two pivots.

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