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)

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

```
B =

[ 1, 2]
[ 2, 4]


ans =
```

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

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 seclclected that
 results in -a^2+a+2 is zero (a=2), 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.
```

Published with MATLAB® R2019b