Show all work. You may leave arithmetic expressions in any form that a calculator could evaluate. By putting your name on this paper, you agree to abide by the university's code of academic integrity in completing the quiz. Use no books, calculators, cellphones, other electronic devices, communication with others, scratchpaper, etc.

Name _____

1. (10) A rotation matrix has the form

$$\begin{bmatrix} c & s \\ -s & c \end{bmatrix}$$

where c is the cosine of some angle θ and s is the sine.

We know that $s^2 + c^2 = 1$. To save storage, we might choose to store a single number representing this matrix, either c or s. If we store s, for example, then we can compute $|c| = \sqrt{1 - s^2}$. To avoid (catastrophic) cancellation in computing the (absolute value of the) missing number, for what range of $\theta \in [0, 2\pi]$ is it better to store c rather than s?

2. (10) Write MATLAB statements using the function `rand`, which generates a sample uniformly distributed in [0,1], to generate a random number from the following distribution:

The probability that the number is 0 is 5/8.

The probability that the number is 2 is 3/8.

In other words, if $f(x)$ is the probability density function, then $f(0) = 5/8$ and $f(2) = 3/8$.