Pre Calc BC Review - MATRICES **Name:**

NO CALCULATOR - UNLESS INDICATED WITH *

1. Indicate each statement as TRUE or FALSE. Determine what is needed to make the false statements true.

   a) Every matrix has an inverse.

   b) Every square, non-zero matrix has an inverse.

   c) Any two matrices can be multiplied.

   d) Any two matrices can be added.

2. Use multiplication of transformation matrices to demonstrate the following:

   a) $R_{30^\circ} \circ R_{30^\circ} \circ R_{30^\circ} = R_{90^\circ}$ b) $r_x \circ r_x = I$

3. ΔABC has coordinates A(2, 1); B(5, 8); C(x, 4). Use determinants to find the value of x knowing that the triangle's area is 20 square units. There are *two* answers.

4. *Use matrices to find the equation of the cubic: $f\left(x\right)=ax^3+bx^2+cx+d$, passing through the points (-2,-10); (-1,-6); (1, 2) and (2,18). SHOW WORK!

5. Consider the two complex matrices: $A = \begin{bmatrix} i & 1 \\ 1 & -i \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 1+i \\ -1 & 1-i \end{bmatrix}$

   a) Find A x B

   b) Find A^2

   c) Find |A| (*ie. det of* A)

   d) Does A have an inverse?

6. Solve* but show method $\begin{bmatrix} a & b & c \\ d & e & f \end{bmatrix} \times \begin{bmatrix} 2 & 1 & 4 \\ 0 & 3 & 2 \\ 4 & 1 & 5 \end{bmatrix} = \begin{bmatrix} 14 & 10 & 23 \\ 32 & 25 & 56 \end{bmatrix}$

7. Equilateral triangle ABC has point A at the origin and B(8, 2).
   Find the coordinates of C in exact radical form) by rotating point B by 60° ccw.

8. Use the matrices below to demonstrate the associative property of multiplication. ie. A(BC) = (AB)C

$$A = \begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix},\ B = \begin{bmatrix} 1 & -1 & 2 \\ 0 & -1 & 1 \end{bmatrix},\ C = \begin{bmatrix} 3 \\ 1 \\ 2 \end{bmatrix}$$

9. Investigate the following statement:
   Given two square matrices [A] and [B], det([A]x[B]) = det[A] x det[B]

10. A population of sea turtles, native to a remote island, has three age classes: hatchling, juvenile and adult, and the following Leslie matrix:

$$\begin{bmatrix} 100 & 0 & 0 \\ 0.3 & 0 & 0 \\ 0 & 0.005 & 0.85 \end{bmatrix}$$

   a) Which class has the lowest survival rate?

   b) What is the probability that a hatchling will survive to become an adult?

   c) What is the probability of an adult surviving for 10 years?

   Assume the population starts at 0 hatchlings, 500 juveniles and 1000 adults.

   d) What are the age class population levels after 1, 5 and 10 years?

	1 year	5 years	10 years
Hatchling			
Juvenile			
Adult			

   e) Would you describe this population as growing, declining or stable?

   f) Suppose one year all the hatchlings and juveniles are wiped out, with just 700 adults remaining. What will happen to the turtles?

Extras:

11. Use reduced row echelon form to find the inverse (BY HAND) of

$$A = \begin{bmatrix} 1 & 3 & 2 \\ 1 & 4 & 2 \\ 1 & 5 & 3 \end{bmatrix}.$$ (Adjoin A to a 3x3 identity matrix).