Pre Calc BC Matrices and Groups Review

1. Which of the five groups below are isomorphic?

G=$\left(z_5^*, \otimes\right)$; H=$\left(z_4, \oplus\right)$; J=square rotation group

K=$\left(\{1, -1, i, -i\}, \times\right)$ M=rectangle symmetry group

a) G~H only b) H~J only c) K~M only
d) H~J~K only e)G~H~J~K

2. Let *a* be an element of group G, a group of order 15. Which of the statements below must not be true?

a) *a* is the identity b) *a* is its own inverse (but not the identity)
c) $a^4 = a$ d) *a* is in a subgroup of G
e) *a* is not in a subgroup of G

3. Consider the operaton $*$ such that $a * b = 2ab$. Which of these is false?

a) there is an identity for $*$ b) $*$ is associative
c) $*$ is commutative
d) $*$ is closed for even numbers e) $*$ forms a group with the even numbers

4. Which of these is a cyclic group?

a) $\left(z_7^*, \otimes\right)$
b) the symmetry group for a square
c) the symmetry group for an equilateral Δ
d) the permutation group of four elements
e) the permutation group of 5 elements

5. Given $\begin{bmatrix} 2 & 3 & a \\ b & 1 & 4 \end{bmatrix} \times \begin{bmatrix} 1 \\ 5 \\ 2 \end{bmatrix} = \begin{bmatrix} 15 \\ 10 \end{bmatrix}$

the sum of a and b is

a) 1 b) -1 c) 4 d) -3 e) -4

6. The transformation matrix $\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$ represents

a) $r_{y=x}$ b) $r_{y=-x}$ c) R_{180°
d) R_{90° e) R_{-90°

7. Given the system of equations:

$$\begin{cases} x - 3y + z = -2 \\ 2x + 3y - 4z = -4 \\ x + y - z = 0 \end{cases}$$

the product *xyz* equals

a) 0 b) 6 c) -3 d) 10 e) -12

8. If $k = \dfrac{453!}{450!3!}$, then

a) $k > 10^{100}$ b) $10^{10} \le k < 10^{100}$
c) $10^5 \le k < 10^{10}$ d) $10 \le k < 10^5$
e) $k < 10$

9. (*p*,*q*) is called a *lattice point* if *p* and *q* are both integers. How many lattice points lie in the area between the two curves $x^2 + y^2 = 9$ and $x^2 + y^2 - 6x + 5 = 0$?

a) 0 b) 1 c) 2 d) 3 e) 4

10. If the determinant of the matrix $\begin{bmatrix} 7 & a \\ 4 & 3 \end{bmatrix}$ = 1

then a must equal

a) -1 b) 0 c) 1 d) 2 e) 5

11. If the matrix $\begin{bmatrix} 0 & -1 \\ 2 & 0 \end{bmatrix}$ is in a multiplicative group, which of these must also be in the group?

I. $\begin{bmatrix} 0 & 1 \\ 2 & 0 \end{bmatrix}$ **II.** $\begin{bmatrix} -2 & 0 \\ 0 & -2 \end{bmatrix}$ III. $\begin{bmatrix} 0 & 0.5 \\ -1 & 0 \end{bmatrix}$

a) **I** only b) **II** only c) **III** only
d) **I** and **II** e) II and **III**