Name:_____   Studio Section:_____

Math 1553 Quiz 6, Fall 2019   (10 points, 10 minutes)
Solutions
Show your work on problems 2 and 3 or you may receive little or no credit.

1. (1 point each) True or false. If the statement is *always* true, answer TRUE. Otherwise, circle FALSE.

a) If A is a 2 × 2 matrix, then $\det(-A) = -\det(A)$.   TRUE | FALSE |
Each row is multiplied by -1, so $\det(-A) = (-1)^2 \det(A) = \det(A)$.

b) If A is a 4 × 4 matrix and $A \begin{pmatrix} 1 \\ 2 \\ 3 \\ 4 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 0 \\ 0 \end{pmatrix}$, then $\det(A) = 0$.

| TRUE | FALSE
$Ax = 0$ has more than just the trivial solution, so A is not invertible.

c) If A and B are $n \times n$ matrices and A and B have the same reduced row echelon form, then $\det(A) = \det(B)$.   TRUE | FALSE |
$\begin{pmatrix} 2 & 0 \\ 0 & 1 \end{pmatrix}$ and $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ have the same RREF, but different determinants.

2. (3 points) Find the area of the triangle with vertices $(-1, 1)$, $(2, 4)$, and $(1, 7)$.

Solution: The vector from $(-1, 1)$ to $(2, 4)$ is $\begin{pmatrix} 3 \\ 3 \end{pmatrix}$ and the vector from $(-1, 1)$ to $(1, 7)$ is $\begin{pmatrix} 2 \\ 6 \end{pmatrix}$. The triangle they determine has half the area of the associated parallelogram, so

$$\text{Area of Triangle} = \frac{1}{2} \left| \det \begin{pmatrix} 3 & 2 \\ 3 & 6 \end{pmatrix} \right| = \frac{1}{2}|3(6) - 3(3)| = \frac{1}{2}(12) = 6.$$

3. (4 points) Find $\det(A)$ for $A = \begin{pmatrix} 3 & 0 & 2 & 3 \\ 0 & 0 & 1 & 3 \\ 1 & 2 & -1 & 1 \\ 1 & 0 & 2 & 4 \end{pmatrix}$.

Solution: We expand along the 2nd column.

$$\det(A) = 2(-1)^{3+2}\det\begin{pmatrix} 3 & 2 & 3 \\ 0 & 1 & 3 \\ 1 & 2 & 4 \end{pmatrix} = -2\Big(3(4-6)-2(0-3)+3(0-1)\Big) = -2(-6+6-3) = 6.$$