Exam 1 Review

I. Match the planar transformation with its geometric interpretation, and give its inverse.

1) $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ E; $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

2) $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$ H $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$

3) $A_{(2,3)}$ A $A_{(-2,-3)}$

4) $\begin{pmatrix} 3 & 0 \\ 0 & 2 \end{pmatrix}$ C $\begin{pmatrix} 1/3 & 0 \\ 0 & 1/2 \end{pmatrix}$

5) $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$ D $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$

6) $A_{(3,2)}$ G $A_{(-3,-2)}$

7) $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$ B $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$

8) $\begin{pmatrix} 2 & 0 \\ 0 & 3 \end{pmatrix}$ F $\begin{pmatrix} 1/2 & 0 \\ 0 & 1/3 \end{pmatrix}$

A) Move points right 2, up 3.

B) Flip over the x-axis.

C) Scale x-coordinate by 3, y-coordinate by 2

D) Flip over $y=x$ line.

E) Does nothing

F) Scale x-coordinate by 2, y-coordinate by 3.

G.) Move points right 3, up 2.

H.) Flip over the y-axis.

II. Let $M = \begin{pmatrix} 3 & -2 \\ 1 & 0 \end{pmatrix}$ & $N = \begin{pmatrix} 3 & 4 \\ 1 & 2 \end{pmatrix}$

1) $M \cdot \begin{pmatrix} 3 \\ -7 \end{pmatrix} = \begin{pmatrix} 9+14 \\ 3+0 \end{pmatrix} = \begin{pmatrix} 23 \\ 3 \end{pmatrix}$

2) $\det(M) = 3 \cdot 0 - (-2)(1) = 2$

3) $\det(N) = 3 \cdot 2 - 4 \cdot 1 = 2$

4) $MN = \begin{pmatrix} 7 & 8 \\ 3 & 4 \end{pmatrix}$

5) $NM = \begin{pmatrix} 13 & -6 \\ 5 & -2 \end{pmatrix}$

6) $M^{-1} = \begin{pmatrix} 0 & 1 \\ -\frac{1}{2} & \frac{3}{2} \end{pmatrix}$

7) $N^{-1} = \begin{pmatrix} 1 & -2 \\ -\frac{1}{2} & \frac{3}{2} \end{pmatrix}$

8) $3 \cdot M = \begin{pmatrix} 9 & -6 \\ 3 & 0 \end{pmatrix}$

III. Find the following vectors:

1) $(3,2)+(-1,4)=$ $(2,6)$

2) $A_{(3,2)}(-1,4)=$ $(2,6)$

3) $A_{(3,2)}(-7,-5)=$ $(-4,-3)$

4) $6\cdot(-1,1)=$ $(-6,6)$

5) $\begin{pmatrix} 1 & 2 \\ 4 & 3 \end{pmatrix}\begin{pmatrix} 7 \\ 2 \end{pmatrix}=\begin{pmatrix} 11 \\ 33 \end{pmatrix}$

6) $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}\begin{pmatrix} 2 \\ 3 \end{pmatrix}=\begin{pmatrix} 2 \\ -3 \end{pmatrix}$

7) $-(7,9)=$ $(-7,-9)$

IV. Find the implied domain:

1) $e^{x^2-x}=1$ $\mathbb{R}$

2) $y^2-3y+1=0$ $\mathbb{R}$

3) $\log_2(x)^2+2\log_2(x)-1=0$ $(0,\infty)$

V. Find all solutions to the following equations:

a) $e^{x^2-x} = 1$, where $x > 0$

$x^2 - x = \log_e(1)$

$x^2 - x = 0$

$x(x-1) = 0$

$x = 0,\ x = 1$

$x = 0$ not in domain $(x>0)$

Set of solutions is $\{1\}$

b) $y^2 + 3y - 1 = 0$

$y = \frac{-3+\sqrt{13}}{2}$ and $y = \frac{-3-\sqrt{13}}{2}$ $\quad b^2 - 4ac = 9 - 4(-1)(1) = 13$

$\left\{ \frac{-3+\sqrt{13}}{2}, \frac{-3-\sqrt{13}}{2} \right\}$

c) $\log_2(x)^2 + 3\log_2(x) - 1 = 0$ $\quad$ Domain $(0, \infty)$

$\log_2(x) = \frac{-3+\sqrt{13}}{2}$ $\quad$ $\log_2(x) = \frac{-3-\sqrt{13}}{2}$

$x = 2^{\left(\frac{-3+\sqrt{13}}{2}\right)}$ $\quad$ $x = 2^{\left(\frac{-3-\sqrt{13}}{2}\right)}$

$\left\{ 2^{\left(\frac{-3+\sqrt{13}}{2}\right)}, 2^{\left(\frac{-3-\sqrt{13}}{2}\right)} \right\}$