ECON 483 - QUIZ
GAME THEORY AND MATRIX ALGEBR

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Only complete work gets full points. Exam is out of 20 (with 6 bonus points). Avoid extra, irrelevant explanations, it will get your more points!

Question 1 (5 points)

(1) Define **Strictly Dominant Strategies**.
(2) Consider the following game. Does either one of the players have a strictly dominant strategy? Why or why not?
(3) Using Iterated Deletion of Strictly Dominated Strategies find the equilibrium. Show your work.
(4) Is this also Nash Equilibrium? Why?

	Left	Center	Right
Top	1,2	3,5	2,1
Middle	0,4	2,1	3,0
Bottom	-1,1	4,3	0,2

Question 2 (5 points)

(1) Is there a strictly dominate strategy in pure strategies? How about in mixed strategies? Show your work, i.e. if you find a dominant strategy in mixed strategies, specify the probabilities.
(2) Define **Best Response Strategies**.
(3) Find all Nash equilibria in pure and mixed strategies?

	Left	Center	Right
Top	2,4	3,0	1,-1
Bottom	3,2	10,3	0,4

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In this part, you can select two question out of three.
There is bonus point if you answer all three of them correctly.

Question 3 (4 points)
Take the following matrices:

$$\mathbf{A} = \begin{pmatrix} 1 & -1 & 1 \\ 2 & 0 & 1 \\ 3 & 0 & 1 \end{pmatrix}, \qquad \mathbf{B} = \begin{pmatrix} 2 & -2 \\ 1 & 3 \\ -4 & 4 \end{pmatrix}$$

Verify directly that $A(AB) = A^2B$.

Question 4* (6 points)
A matrix is called symmetric if $A^T = A$, and it is called skew-symmetric if $A^T = -A$.

(1) Show that any square matrix M could be written as $M = A + B$ where A is a **symmetric** matrix while B is a **skew-symmetric** matrix. (Hint: Find expressions for A and B -as functions of M- that satisfy the definitions of symmetric and skew-symmetric matrices.)

(2) Find A and B for the following matrix M.

$$\mathbf{M} = \begin{pmatrix} 12 & 7 & 1 \\ -2 & -4 & 0 \\ 0 & -8 & 2 \end{pmatrix}$$

Question 5* (6 points)
Take the following matrix equation:

$$\mathbf{Ax} = \lambda\mathbf{x}$$

where λ is a number and

$$\mathbf{A} = \begin{pmatrix} 1 & 4 \\ 1 & 1 \end{pmatrix}, \qquad \mathbf{x} = \begin{pmatrix} x_1 \\ x_2 \end{pmatrix}$$

Find λ and $\mathbf{x}$. Note that there are two acceptable values for both $\lambda, \mathbf{x}$. (Hint: First try to write the matrix equation in terms of two simultaneous regular equations and find λ. Then substitute λ in your two equations to find x_1, x_2. You need to choose a value for one of them, e.g. $x_1 = 1$ and then find x_2).