Midterm Test MATA33 (Summer 2019, UTSC)

You have 100 minutes for this midterm test. There are 50 points in total. No aids allowed. Any violation of academic integrity is forbidden and will be prosecuted. Your solutions must be written down in a clear, consistent and explicitly complete way. You are required to clearly fill in your name and student number below (otherwise your exam is not accepted).

Total Points Calculation

Problem 1 :	/10
Problem 2 :	/10
Problem 3 :	/15
Problem 4 :	/15
Total :	/50

Problem 1: Matrix Algebra

Let $A = \begin{pmatrix} 6 & 9 \\ -4 & -6 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 2 \\ -1 & 0 \end{pmatrix}$.

(1a) **(4pts)** Find $(A + 3B)^T$.

(1b) **(6pts)** Find $AB - BA$.

Continue your solution of Problem 1 here.

Problem 2: System of Equations

(10pts) Solve the following linear system using row reduction.

$$\begin{cases} x + 2y + 3z = 9 \\ 2x - y + z = 8 \\ 3x - z = 3 \end{cases}$$

Continue your solution of Problem 2 here.

Problem 3: Matrix Inverse

(15pts) Let $A = \begin{pmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{pmatrix}$.

(3a) **(9pts)** Find the matrix inverse A^{-1}.

(3b) **(6pts)** Write $B = \begin{pmatrix} 1 \\ 2 \\ 5 \end{pmatrix}$ as a sum of columns of A.

Continue your solution of Problem 3 here.

Problem 4: Linear Programming

(15pts) Find the minimal value of cost function

$$C(x, y) = 600x + 400y$$

subject to the constraints:

- $20x + 20y \geq 500$;

- $12x + 48y \geq 480$;

- $40x + 20y \geq 800$;

- $x \geq 0$;

- and $y \geq 0$.

Continue your solution of Problem 4 here.

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