

**Dawson College
Mathematics Department
Final Examination
201-105-DW
Wednesday, December 22, 2010**

Student Name: _____

Student I.D. #: _____

Teacher: _____

Instructors: L. Frajberg, G. Honnouvo, O. Zlotchevskaia

TIME: 14:00 – 17:00 (3 hours)

INSTRUCTIONS:

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1. (6 marks) If $A = \begin{bmatrix} 1 & 3 & -2 \\ 2 & 4 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 2 \\ 1 & -1 \\ 1 & 3 \end{bmatrix}$,

find i) $3A - 2B^T$.

ii) $2AB$.

2. (4 marks) If $(2A^T)^{-1} = \begin{bmatrix} 4 & 1 \\ 7 & 3 \end{bmatrix}$, find A .

3. (5 marks) Find the general solution of the following system using Gauss or Gauss Jordan method.

$$\begin{aligned}x_1 + 2x_2 - 2x_3 &= 3 \\2x_1 - 5x_2 + 4x_3 &= 6 \\-x_1 + 16x_2 - 14x_3 &= -3\end{aligned}$$

4. (7 marks)

ii) Use your answer from i) to solve

$$\begin{aligned}x_1 - 2x_2 + 2x_3 &= -3 \\2x_1 - 3x_2 + 4x_3 &= -5 \\x_1 - x_2 + 4x_3 &= -6\end{aligned}$$

5. (4 marks) If $A^2 - 3A + 2I = 0$, find A^{-1}

6. (10 marks)

i) Suppose A is a 3×3 matrix such that $\det(2A^{-1}) = 3$, find $\det A$.

ii) If A is a 3×3 matrix find $\det(3A^T A^2)$ given that $\det A = 2$.

iii) If $\det A = 2$, what is $\det(A^{-1} + 3adj A)$? Assume A is 2×2 .

7.

8.

9. (4 marks) Consider $\begin{cases} (k-2)x+4y=0 \\ x+(k+1)y=0 \end{cases}$ For which values of k will the system have non-trivial (non-zero) solutions?

11. (5 marks) If $A(1, -2, 1)$, $B(3, 1, 4)$, $C(4, 1, -1)$ are the vertices of a triangle, find the area

13. (4 marks) Find the parametric equations of the line which passes through $P(1, -1, 2)$ and is perpendicular to the plane whose equation is $-4x + 3y + z + -10 = 0$.

14. (4 marks) Find the equation of the plane through $P(4, -2, 1)$ which is parallel to both $\vec{u} = [2, 1, 3]$ and $\vec{v} = [1, -2, 0]$.

18. (8 marks) Minimize $z = 4x_1 + 3x_2$ subject to the constraints

$$2x_1 + 3x_2 \geq 8$$

$$2x_1 + x_2 \geq 14$$

$$(x_1 \geq 0, x_2 \geq 0)$$