

# Philadelphia University Department of Basic Sciences and Mathematics 

| Academic Year: | $2015-2016$ | Course Name: | Linear Algebra (1) |
| :--- | :--- | :--- | :--- |
| Semester: | Second Semester |  |  |
| Exam: | First Exam | Course Number: <br> Instructor Name: | 250241 <br> Feras Awad |
| Exam Date: | $06 / 04 / 2016$ | Student Name: | - |
| Exam Day: | Wednesday | University ID: | - |
| Exam Mark: | $[20]$ | Serial: | - |

1. (2 points) Simplify the expression $(A B)^{-1}\left(A C^{-1}\right)\left(D^{-1} C^{-1}\right)^{-1} D^{-1}$ assuming that $A$, $B, C$, and $D$ are invertible.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
2. (2 points) Find the values of $x$ that make the matrix $\left[\begin{array}{ll}9 & -x \\ x & -1\end{array}\right]$ singular.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$

[^0]3. (2 points) If $A$ is an $m \times n$ matrix such that $A^{T} B A$ is defined, find the size of the matrix $B$.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$

4. (3 points) Find the matrix $A$ if $\left(5 A^{T}\right)^{-1}=\left[\begin{array}{cc}-3 & -1 \\ 5 & 2\end{array}\right]$.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
5. (2 points) Show that if $A$ and $B$ are commute, then $(A B)^{-1}=A^{-1} B^{-1}$.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
6. (3 points) A square matrix $A$ is said to be idempotent if $A^{2}=A$. Show that if $A$ is idempotent then $(2 A-I)$ is invertible and is its own inverse.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
7. (6 points) Solve the following linear system using Gaussian elimination with back substitution.

$$
\begin{aligned}
x_{1} & -3 x_{3}
\end{aligned}=-2 \begin{aligned}
& =x_{2}-2 x_{3}
\end{aligned}=5 x_{1}+x_{3}=4
$$

$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$


[^0]:    ${ }^{1}$ Internal Examiner : Dr. Marouf Samhan

