**Dawson College: Linear Algebra** (SCIENCE): 201-NYC-05-S4: Winter 2017

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# Quiz 7

This quiz is graded out of 10 marks. No books, calculators, notes or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work. If you need more space for your answer use the back of the page.

**Question 1.** §2.3 #21 *(3 marks)* Decide whether the given matrix is invertible, and if so, use the adjoint method to find its inverse.

$$A = \begin{bmatrix} 2 & -3 & 5 \\ 0 & 1 & -3 \\ 0 & 0 & 2 \end{bmatrix}$$

$\det A = 2(1)(2) = 4 \neq 0 \quad \therefore A$ is invertible

$C_{11} = (-1)^{1+1}\begin{vmatrix} 1 & -3 \\ 0 & 2 \end{vmatrix} = 2$

$C_{12} = (-1)^{1+2}\begin{vmatrix} 0 & -3 \\ 0 & 2 \end{vmatrix} = 0$

$C_{13} = (-1)^{1+3}\begin{vmatrix} 0 & 1 \\ 0 & 0 \end{vmatrix} = 0$

$C_{21} = (-1)^{2+1}\begin{vmatrix} -3 & 5 \\ 0 & 2 \end{vmatrix} = 6$

$C_{22} = (-1)^{2+2}\begin{vmatrix} 2 & 5 \\ 0 & 2 \end{vmatrix} = 4$

$C_{23} = (-1)^{2+3}\begin{vmatrix} 2 & -3 \\ 0 & 0 \end{vmatrix} = 0$

$C_{31} = (-1)^{3+1}\begin{vmatrix} -3 & 5 \\ 1 & -3 \end{vmatrix} = 4$

$C_{32} = (-1)^{3+2}\begin{vmatrix} 2 & 5 \\ 0 & -3 \end{vmatrix} = 6$

$C_{33} = (-1)^{3+3}\begin{vmatrix} 2 & -3 \\ 0 & 1 \end{vmatrix} = 2$

$$A^{-1} = \frac{1}{\det A}\operatorname{adj} A = \frac{1}{4}\begin{bmatrix} 2 & 0 & 0 \\ 6 & 4 & 0 \\ 4 & 6 & 2 \end{bmatrix}^T = \frac{1}{4}\begin{bmatrix} 2 & 6 & 4 \\ 0 & 4 & 6 \\ 0 & 0 & 2 \end{bmatrix}$$

**Question 2.** #3.4.10 *(3 marks)* Let $B$ be a $3 \times 3$ matrix where $\det(B) = 3$. Find $\det\left(2B + B^2\operatorname{adj}(B)\right)$.

note: $B^{-1} = \frac{1}{\det B}\operatorname{adj} B$

$3B^{-1} = \operatorname{adj} B$

$$\begin{aligned}
&\det(2B + B^2 \operatorname{adj} B) \\
&= \det(2B + BB\,3B^{-1}) \\
&= \det(2B + 3BBB^{-1}) \\
&= \det(2B + 3BI) \\
&= \det(5B) \\
&= 5^3 \det B \\
&= 5^3 \cdot 3
\end{aligned}$$

**Question 3.** §3.1 #TF *(2 marks)* Determine whether the statement is true or false, and justify your answer.
Two equivalent vectors must have the same initial point.

False, by definition 2 vectors are equivalent iff they have the same direction and magnitude. Their initial point is of no consequence.

**Question 4.** §3.1 #TF *(2 marks)* Determine whether the statement is true or false, and justify your answer.
If $a$ and $b$ are scalars such that $a\vec{u} + b\vec{v} = \vec{0}$, then $\vec{u}$ and $\vec{v}$ are parallel vectors.

False, if $a = b = 0$ and $\vec{u} = (1,1)$, $\vec{v} = (1,2)$ then $a\vec{u} + b\vec{v} = \vec{0}$ but $\vec{u}$ and $\vec{v}$ are not parallel vectors.