## 12.4.3 In Preparation for this Week's Enrichment

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Week 12 due Dec 29, 2023 10:42 IST

# 12.4.3 In Preparation for this Week's Enrichment

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## Reading Assignment

0 points possible (ungraded)
Read Unit 12.4.3 of the notes. [LINK]

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## Homework 12.4.3.1

1/1 point (graded)
Let $A \in \mathbb{R}^{n \times n}$ and $x$ equal an eigenvector of $A$. Assume that $x$ is real valued as is the eigenvalue $\lambda$ with $Ax = \lambda x$.

$\lambda = \frac{x^T Ax}{x^T x}$ is the eigenvalue associated with the eigenvector $x$.

Always ✔ Answer: Always

$Ax = \lambda x$ implies that $x^T Ax = x^T (\lambda x) = \lambda x^T x$. But $x^T x \neq 0$ since $x$ is an eigenvector. Hence $\lambda = x^T Ax / (x^T x)$.

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## Homework 12.4.3.2

1/1 point (graded)
Let $A \in \mathbb{R}^{n \times n}$ be nonsingular, $\lambda \in \Lambda(A)$, and $Ax = \lambda x$. Then $A^{-1}x = \frac{1}{\lambda}x$.

TRUE ✔ Answer: TRUE

$Ax = \lambda x$ means that $\frac{1}{\lambda}A^{-1}Ax = \frac{1}{\lambda}A^{-1}\lambda x$ which means that $\frac{1}{\lambda}x = A^{-1}x$.

Calculator

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## Homework 12.4.3.3

10/10 points (graded)

Let $A \in \mathbb{R}^{n \times n}$ and $\lambda \in \Lambda(A)$. Then $(\lambda - \mu) \in \Lambda(A - \mu I)$.

TRUE ✔ Answer: TRUE

Let $Ax = \lambda x$ for $x \neq 0$. Then

$$(A - \mu I)x = Ax - \mu Ix = Ax - \mu x = \lambda x - \mu x = (\lambda - \mu)x.$$

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Calculator

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