Dashboard / Courses / Undergraduate / BSc Eng Hons / Eng-MATH / In19-S4-MA2033 (115096) / MID1-26/05/2022-7.30pm(NO ZOOM NEEDED) / MID1

Started on	Thursday, 26 May 2022, 7:31 PM
State	Finished
Completed on	Thursday, 26 May 2022, 8:17 PM
Time taken	46 mins 7 secs
Grade	**5.58** out of 15.00 (**37**%)

Question **1**

Incorrect

Mark 0.00 out of 1.00

Consider the vector space $\mathbb{R}_2[x]$ over $\mathbb{R}$ with the inner product $< f, g >= \int_{-1}^{1} f(x)g(x)dx$. The ordered basis $(x^2, x, 1)$ when converted to an orthogonal ordered basis, by taking elements in the given order, has the form

- a. $(x^2, x, 5 - 3x^2)$
- b. $(x^2, x, 1)$
- c. $(1, x, 3x^2 - 1)$ ✖
- d. $(x^2, x, 3 - 5x^2)$

Your answer is incorrect.

The correct answer is:
$(x^2, x, 3 - 5x^2)$

Question **2**

Incorrect

Mark 0.00 out of 1.00

Let $T : \mathbb{R}_3[x] \to \mathbb{R}_3[x]$ be a linear transformation over $\mathbb{R}$ given by $T(p(x)) = \frac{d}{dx}(p(x)) + p(x)$. What are the values of $\text{null}(T)$ and $\text{rank}(T)$?

- a. 3 and 1
- b. 2 and 2
- c. 4 and 0
- d. 0 and 4
- e. 1 and 3 ✖

Your answer is incorrect.

The correct answer is:
0 and 4

Question **3**

Incorrect

Mark 0.00 out of 1.00

Let $W = \{(1, 1, -1)\}$ in the vector space $\mathbb{R}^3$ over $\mathbb{R}$. Inner product is the usual dot product. Which of the following are true?

- [ ] a. $(W^{\perp})^{\perp} = \{(1, 1, -1)\}$
- [x] b. $W^{\perp} = \{(0, 1, 1)\}$ ✖
- [ ] c. $W^{\perp} = \{(1, 0, 1)\}$
- [x] d. $W^{\perp} = \{(1, 0, 1), (0, 1, 1)\}$ ✖
- [ ] e. $(W^{\perp})^{\perp} = \text{span}\{(-1, -1, 1)\}$
- [ ] f. $W^{\perp} = \text{span}\{(1, 1, 2), (1, -1, 0)\}$

Your answer is incorrect.

The correct answers are:
$W^{\perp} = \text{span}\{(1, 1, 2), (1, -1, 0)\}$

,

$(W^{\perp})^{\perp} = \text{span}\{(-1, -1, 1)\}$

Question **4**

Incorrect

Mark 0.00 out of 1.00

Consider the linear trasformation $T : \mathbb{R}^3 \to \mathbb{R}^2$ over the field $\mathbb{R}$ given by $T((x, y, z)) = (x + y - z, x - y - z)$. A basis for $\ker(T)$ is

- [ ] a. $\{(1, 1), (1, 0)\}$
- [ ] b. $\{(1, 0, 1)\}$
- [x] c. $\{(1, 1), (1, -1)\}$ ✖
- [ ] d. $\{(-1, 0, -1)\}$

Your answer is incorrect.

The correct answers are:
$\{(1, 0, 1)\}$

,

$\{(-1, 0, -1)\}$

Question **5**
Partially correct
Mark 0.75 out of 1.00

Which of the following statements are true in an inner product space?

- [ ] a. linearly independent vectors are orthogonal
- [x] b. orthonormal vectors are orthogonal ✔
- [x] c. orthonormal vectors are linearly independent ✔
- [x] d. orthogonal vectors are linearly independent ✖
- [ ] e. linearly independent vectors are orthonormal
- [ ] f. orthogonal vectors are orthonormal

Your answer is partially correct.
You have selected too many options.
The correct answers are:
orthonormal vectors are orthogonal,
orthonormal vectors are linearly independent

Question **6**
Partially correct
Mark 0.67 out of 1.00

What is always true abut the Hamel Base B of the vector space V over the field F?

- [x] a. Only finite linear combinations are taken from B ✔
- [ ] b. Only infinite linear combinations are taken from B
- [ ] c. B is finite
- [ ] d. B is uncountable
- [ ] e. $V = \operatorname{span}(\operatorname{span} B)$
- [ ] f. B is countable
- [x] g. B always exists ✔

Your answer is partially correct.
You have correctly selected 2.
The correct answers are:
Only finite linear combinations are taken from B
,
$V = \operatorname{span}(\operatorname{span} B)$
,
B always exists

Question 7
Correct
Mark 1.00 out of 1.00

Let $T:\mathbb{R}_3[x]\to\mathbb{R}_3[x]$ be a linear transformation over $\mathbb{R}$ given by $T(p(x))=\frac{d}{dx}(p(x))$. What are the values of $\text{null}(T)$ and $\text{rank}(T)$?

- a. 4 and 0
- b. 2 and 2
- c. 3 and 1
- d. 1 and 3 ✔
- e. 0 and 4

Your answer is correct.

The correct answer is:
1 and 3

Question 8
Incorrect
Mark 0.00 out of 1.00

Consider the linear Transformation $T:\mathbb{R}_2[x]\to\mathbb{R}_3[x]$ over $\mathbb{R}$ given by $T(p(x))=\frac{d}{dx}(p(x))+\int_0^x p(t)dt$. With the ordered base $(1,x,x^2)$ given for $\mathbb{R}_2[x]$ and the ordered base $(1,x,x^2,x^3)$ given for $\mathbb{R}_3[x]$, what is the matrix of T?

Here we use a notation where a matrix with 1st ROW (a,b,c) and 2nd ROW (e,f,g) is written as $((a,b,c),(d,e,f))$

- a. $((0,1,0),(1,0,2),(1,\frac{1}{2},0),(0,0,\frac{1}{3}))$
- b. $((0,1,0,0),(1,0,\frac{1}{3},0),(0,2,0,\frac{1}{4}))$
- c. $((0,1,0),(1,0,2),(1,\frac{1}{3},0),(0,0,\frac{1}{4}))$
- d. $((0,1,0,0),(1,0,\frac{1}{2},0),(0,2,0,\frac{1}{3}))$ ✖

Your answer is incorrect.

The correct answer is:
$((0,1,0),(1,0,2),(1,\frac{1}{2},0),(0,0,\frac{1}{3}))$

Question 9
Incorrect
Mark 0.00 out of 1.00

Which of the following are examples for "subspace U of the vector space V over the field F"?
Here vector addition is usual addition and scalar multiplication is usual multiplication.

- [ ] a. $\mathbb{Q}$ of $\mathbb{R}$ over $\mathbb{Q}$
- [ ] b. $\mathbb{R}$ of $\mathbb{C}$ over $\mathbb{R}$
- [x] c. $\mathbb{Z}$ of $\mathbb{C}$ over $\mathbb{R}$ ✖
- [x] d. $\mathbb{Z}$ of $\mathbb{Q}$ over $\mathbb{Z}$ ✖
- [ ] e. $\mathbb{C}$ of $\mathbb{R}$ over $\mathbb{Q}$
- [x] f. $\mathbb{R}$ of $\mathbb{C}$ over $\mathbb{Q}$ ✔
- [ ] g. $\mathbb{Z}$ of $\mathbb{Q}$ over $\mathbb{Q}$

Your answer is incorrect.

The correct answers are:
$\mathbb{Q}$ of $\mathbb{R}$ over $\mathbb{Q}$
,
$\mathbb{R}$ of $\mathbb{C}$ over $\mathbb{R}$

,
$\mathbb{R}$ of $\mathbb{C}$ over $\mathbb{Q}$

Question 10

Partially correct

Mark 0.42 out of 1.00

Which of the following are examples for "vector space V over the field F"?

Here vector addition is usual addition and scalar multiplication is usual multiplication.

- [x] a. $\mathbb{R}$ over $\mathbb{Q}$ ✔
- [x] b. $\mathbb{Q}$ over $\mathbb{Z}$ ✖
- [ ] c. $\mathbb{Q}$ over $\mathbb{R}$
- [ ] d. $\mathbb{Z}$ over $\mathbb{Q}$
- [x] e. $\mathbb{Q}$ over $\mathbb{Q}$ ✔
- [ ] f. $\mathbb{R}$ over $\mathbb{R}$
- [ ] g. $\mathbb{Z}$ over $\mathbb{Z}$

Your answer is partially correct.

You have correctly selected 2.

The correct answers are:

$\mathbb{R}$ over $\mathbb{R}$

,

$\mathbb{R}$ over $\mathbb{Q}$

,

$\mathbb{Q}$ over $\mathbb{Q}$

Question 11

Correct

Mark 1.00 out of 1.00

Consider the set of solutions V of the differential equation $\frac{dy}{dx} - \frac{1}{2y} = 0$ over the field $F = \mathbb{R}$. Which of the following are true?

- [x] a. $\{\sqrt{x}, -\sqrt{x}\} \subset V$ ✔
- [ ] b. $\{\sqrt{x}, -\sqrt{x}\}$ is a basis for V
- [ ] c. $\{\sqrt{x}, -\sqrt{x}\}$ is linearly independent
- [x] d. V is not a vector space ✔
- [ ] e. $V = \mathrm{span}\{\sqrt{x}, -\sqrt{x}\}$

Your answer is correct.

The correct answers are:

V is not a vector space

,

$\{\sqrt{x}, -\sqrt{x}\} \subset V$

Question 12

Partially correct

Mark 0.67 out of 1.00

Which of the following are inner products $< u, v >$ in the vector space V over the field F?

Here the vector addition is usual addition and the scalar multiplication is multiplying by a number.

- [x] a. $< x, y >= xy$ in $\mathbb{R}$ over $\mathbb{R}$ ✔
- [ ] b. $< A, B >= \det(AB)$ in $\mathbb{R}^{n\times n}$ over $\mathbb{R}$
- [x] c. $< f, g >= \int_0^\infty f(x)g(x)dx$ in $\mathcal{C}[0, \infty)$ over $\mathbb{R}$ ✖
- [ ] d. $< f, g >= \int_0^\infty e^{-x} f(x)g(x)dx$ in $\mathcal{C}[0, \infty)$ over $\mathbb{R}$

Your answer is partially correct.

You have selected too many options.

The correct answer is:

$< x, y >= xy$ in $\mathbb{R}$ over $\mathbb{R}$

Question 13

Partially correct

Mark 0.75 out of 1.00

Consider the inner product $< f, g >= \int_{-1}^1 f(x)g(x)dx$ in the vector space $\mathbb{R}_3[x]$ over $\mathbb{R}$. The best approximation to $2 + 3x + 4x^2$ in $W = \text{span}\{1, x\}$ is

- [ ] a. $4x^2$
- [ ] b. 0
- [ ] c. $4 + 2x$
- [x] d. $2 + 3x$ ✖
- [x] e. $\frac{10}{3} + 3x$ ✔

Your answer is partially correct.

You have selected too many options.

The correct answer is:

$\frac{10}{3} + 3x$

Question 14

Partially correct

Mark 0.33 out of 1.00

Let $V = \mathbb{C}^{n\times n}$ and $F = \mathbb{C}$. The vector addition is the matrix addition and the scalar multiplication is multiplying the matrix by a number. Also define the function $< A, B >= \text{trace}(A^H B)$ where $A^H = \overline{A}^T$ is the conjugate transpose.

- a. V is a vector space over F if the vector addition is the matrix multiplication.
- b. $< A, A >= 0 \Leftrightarrow A = O$ is not true
- c. V is a vector space over F. ✔
- d. Cauchy-Schwarz inequality looks like $|\text{trace}(A^H B)| \leq \|A\|_E \|B\|_E$ where $\|A\|_E = \sqrt{\sum_{i=1}^{n} |a_{ii}|^2}$ is the Frobeneous norm.
- e. $< A, B >$ is an inner product on V

Your answer is partially correct.

You have correctly selected 1.

The correct answers are:

V is a vector space over F.

,

$< A, B >$ is an inner product on V

,

Cauchy-Schwarz inequality looks like $|\text{trace}(A^H B)| \leq \|A\|_E \|B\|_E$ where $\|A\|_E = \sqrt{\sum_{i=1}^{n} |a_{ii}|^2}$ is the Frobeneous norm.

Question 15

Incorrect

Mark 0.00 out of 1.00

Consider the linear trasformation $T : \mathbb{R}^3 \to \mathbb{R}^2$ over the field $\mathbb{R}$ given by $T((x, y, z)) = (x + y - z, x - y - z)$. A basis for $\text{ran}(T)$ is

- a. $\{(1, 0, 1)\}$ ✖
- b. $\{(1, 1), (1, 0)\}$
- c. $\{(-1, 0, -1)\}$ ✖
- d. $\{(1, 1), (1, -1)\}$

Your answer is incorrect.

The correct answers are:

$\{(1, 1), (1, -1)\}$

,

$\{(1, 1), (1, 0)\}$

Previous activity

◄ MID1-instructions

Jump to...

Next activity

Assignment 1-Due Sunday 5th June ►