明新科技大學92學年度研究所 □一般生 □在職生 招生入學考試命題紙（5-1）

科　　目	考試日期	節　次	准考證號碼
微　積　分	92年5月11日	第 1 節	

一、選擇題（共20題；每題3分）

1. 若拋物線 $y = x^2 + ax + b$ 與曲線 $y = x^3$ 在點 (1,1) 相切，則 (a, b) =

(A) (1, -1)

(B) (-1,1)

(C) (-2,2)

(D) (2,-2)

(E) 以上皆非。

2. 函數 $f(x) = x^2 - xe^x + e^x$ 之圖形與 x 軸相交於幾點？

(A) 0

(B) 1

(C) 2

(D) 3

(E) 4。

3. Use the trapezoidal rule with 4 subintervals to estimate $\int_1^3 \frac{1}{x}dx$, the answer will be

(A) $\frac{67}{60}$

(B) $\frac{67}{40}$

(C) $\frac{67}{50}$

(D) $\frac{67}{30}$

(E) $\frac{67}{20}$.

4. $\lim_{x\to 3} \frac{\sin(x-3)}{x^2 - x - 6} =$

(A) 0

(B) $\frac{1}{5}$

(C) $\frac{1}{2}$

(D) 1

(E) 不存在。

5. 下列何者爲真？

(A) 若 $\lim_{t\to\infty} \int_{-t}^{t} f(x)dx$ 存在，則 $\int_{-\infty}^{\infty} f(x)dx$ 必存在

(B) 若函數 f 在(a,b)連續，則 f 在(a,b) 可微分

(C) 若函數 f 在[a,b]連續，則 f 在[a,b]可積分

(D) 若函數 f 在[a,b] 不連續，則 f 在[a,b]不可積

(E) 若 $\lim_{x\to\infty}(f(x+g(x))$ 存在，則 $\lim_{x\to\infty} f(x)$ 和 $\lim_{x\to\infty} g(x)$ 必存在。

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6. 設 $f(x)=\int_{\pi/2}^{\pi} t\sin t\,dt$, $\frac{\pi}{2}\le x\le 4$ ，則 $f(x)$ 之極大值爲

(A) 1

(B) π

(C) 4sin4

(D) $\frac{\pi}{2}$

(E) π -1。

7. If $A=\left\{(x,y)\middle| y\ge \sin x, y\le 1+\cos x, 0\le x\le \frac{\pi}{2}\right\}$, the area of A is

(A) $\pi+1$

(B) π

(C) $\pi+1/2$

(D) $\frac{\pi}{2}$

(E) $\frac{\pi+1}{2}$.

8. 下列敘述何者爲錯誤的？

(A) $\int_0^{2\pi}|\sin x|dx = 4\int_0^{\pi/2}\sin x dx$

(B) $\int_{-1}^{1}\frac{1}{x}dx = 0$

(C) $\int_0^1 \frac{1}{1+x^2}dx = \frac{\pi}{4}$

(D) $\int_0^{\infty}\frac{dx}{(x+2)^2} = 1$

(E) 以上皆非。

9. $\sum_{n=1}^{+\infty} a_n$ is a given series , which of the following statement is not true ?

(A) If $\lim_{n\to+\infty}\sum_{k=1}^{n} a_k$ exists, $\sum_{n=1}^{+\infty} a_n$ converges.

(B) If $\lim_{n\to+\infty} a_n \neq 0$, $\sum_{n=1}^{+\infty} a_n$ diverges.

(C) If $\sum_{n=1}^{+\infty}|a_n|$ converges, $\sum_{n=1}^{+\infty} a_n$ converges.

(D) If $\sum_{n=1}^{+\infty} a_n$ diverges, $\sum_{n=1}^{+\infty}|a_n|$ diverges.

(E) If $\sum_{n=1}^{+\infty} a_n$ converges, $\sum_{n=1}^{+\infty}(-1)^n a_n$ converges.

10. If A, B, C are matrices, which of the following is true?

(A) If AB exists, $AB=BA$.

(B) If A is a skew symmetric matrix, the diagonal elements of A are all zero.

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(C) $trace\begin{pmatrix} 1 & 7 & 3 \\ -1 & 5 & 2 \\ 2 & 3 & -4 \end{pmatrix} = -20.$

(D) Iif A is a $n \times n$ matrix, c is a real number, $\det(cA)=c\det(A)$.

(E) If $\det(A)=0$, the linear system $AX=b$, $b \neq 0$ has no solution.

11. Which of the following statements is true?

(A) Matrix multiplication is a vector-space operation on the set M of all $n \times n$ matrices.

(B) Every vector space has at least two vectors.

(C) Multiplication of any vector by the zero scalar always yields the zero vector.

(D) The set Q of all rational numbers is a real vector space under the usual operations of addition and scalar multiplication.

(E) None of the above.

12. Which of the following statements is true?

(A) $\{(x_1,x_2,x_3) | x_1+x_2+x_3=1\}$ is a subspace of R^3.

(B) $S=\{(x,1)^t | x \in R\}$ is a subspace of R^2.

(C) $S=\{(x_1,x_2,x_3)^t | x_1=x_2\}$ is a subspace of R^3.

(D) If V and W are two subspace of R^n, then both $V \cap W$ and $V \cup W$ are subspaces of R^n.

(E) None of the above.

13. Which of the following statements is not true?

(A) The standard operations in R^n are vector addition and scalar multiplication.

(B) The additive inverse of a given vector is not unique.

(C) A vector space consists of four entities: a set of vectors, a set of scalars, and two operations.

(D) A linearly independent spanning set S is called a basis of a vector space V.

(E) The set of points on the line given by $x+y=0$ is a subspace of R^2.

14. The Wronskian for the given set of function $\{e^{-x}, xe^{-x}, (x+3)e^{-x}\}$ is

(A) $2e^{-3x}$

(B) e^{-3x}

(C) $2e^{3x}$

(D) e^{3x}

(E) 0.

15. Let A and B be similar matrices, which one of the following statement is not true?

(A) If A is singular, then so is B and A^{-1} and B^{-1} are similar.

(B) A^T and B^T are similar.

(C) There exists a matrix P such that $B^K = P^{-1}A^K P$.

(D) If B is similar to C, then A is similar to C.

(E) All of the above.

16. Let $T: R^3 \to R^2$ be a linear transformation such that $T(1)=1-x, T(x)=x+x^2$,

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$T(x^2)=1+2x$ and $T(x^3)=2-x^2$, then $T(2-3x+x^2-2x^3)=$

(A) $-2+3x+2x^2$

(B) $-2+3x-x^2$

(C) $-2-3x-2x^2$

(D) $-1+3x-x^2$

(E) $-1-3x-x^2$.

17. Which statement is not true?

(A) An $n\times n$ matrix P is orthogonal if and only if its column vectors form an orthonormal set.

(B) Let A be an $n\times n$ symmetric matrix. If λ_1 and λ_2 are distinct eigenvalues of A, then their corresponding eigenvectors X_1 and X_2 are orthogonal.

(C) Let A be an $n\times n$ matrix, then A is orthogonally diagonalizable and has real eigenvalues if and only if A is not symmetric.

(D) If A and B are similar $n\times n$ matrices, then they have the same eigenvalues.

(E) None of the above.

18. Let A be an $n\times n$ matrix, and let λ be an eigenvalue of A, then which one of the following statement is not true?

(A) λ^k is an eigenvalue of A^k, k=2,3,.....

(B) If A is nonsingular, then $1/\lambda$ is an eigenvalue of A^{-1}.

(C) If c is any scalar, then $\lambda+c$ is an eigenvalue of $A+cI$.

(D) A and A^T have different eigenvalues.

(E) None of the above

19. Which of the following set of vectors in R^n is not orthogonal?

(A) $\{(4,-1,1),(-1,0,4),(-4,-17,-1)\}$

(B) $\{(\frac{\sqrt{2}}{2},0,0,\frac{\sqrt{2}}{2}),(0,\frac{\sqrt{2}}{2},\frac{\sqrt{2}}{2}0),(-\frac{1}{2},\frac{1}{2},-\frac{1}{2},\frac{1}{2})\}$

(C) $\{(\frac{\sqrt{2}}{2},0,\frac{\sqrt{2}}{2}),(-\frac{\sqrt{6}}{6},\frac{\sqrt{6}}{3},\frac{\sqrt{6}}{6}),(\frac{\sqrt{3}}{3},\frac{\sqrt{3}}{3},-\frac{\sqrt{3}}{3})\}$

(D) $\{(\frac{\sqrt{2}}{3},0,-\frac{\sqrt{2}}{6}),(0,\frac{2\sqrt{5}}{5},-\frac{\sqrt{5}}{5}),(\frac{\sqrt{5}}{5},0,\frac{1}{2})\}$

(E) None of the above.

20. The matrix A' for $T:R^2\to R^2, T(x_1,x_2)=(2x_1-2x_2,-x_1+3x_2)$, relative to the basis $B'=\{(1,0),(1,1)\}$ is

(A) $A'=\begin{bmatrix}3&-2\\-1&2\end{bmatrix}$

(B) $A'=\begin{bmatrix}2&3\\-1&-3\end{bmatrix}$

(C) $A'=\begin{bmatrix}1&-1\\-2&3\end{bmatrix}$

(D) $A'=\begin{bmatrix}2&-2\\-2&1\end{bmatrix}$

(E) $A'=\begin{bmatrix}2&-2\\-1&2\end{bmatrix}$

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二、填充題（共 10 題；每題 4 分）

21. 若 $\lim_{x\to 2}\frac{a\sqrt{x+7}+b}{x-2}=2$，則 $a+b=$（21）。

22. $\int(e^{3x}+e^{2x})^{1/2}dx=$（22）；

23. $\int_0^1\int_x^1 e^{-y^2}dydx=$（23）.

24. $\lim_{t\to\infty}\frac{\int_0^{\sqrt{t}}(1-x)^2dx}{\int_0^t\sqrt{x}\,dx}=$（24）.

25. The interval of convergence of the series $\sum_{n=0}^{\infty}\frac{(-3)^n x^n}{\sqrt{n+1}}$ is（25）.

26. If $f(x)=e^{-x^2}$, we have $f^{(2n)}(0)=$（26）.

27. Given the set of data points as {(-2,2), (-1,1), (0,1), (1,3)}, then the least squares regression line for this set of data point is（27）.

28. The matrix that rotate counterclockwise by $\pi/3$ and then reflects about the line $y=-x$ is（28）.

29. For the vectors $u=(0,1,3,-6)$ and $v=(-1,1,2,2)$, the orthogonal projection of u onto v is（29）.

30. If $A=\begin{bmatrix}5 & -6\\ 3 & -4\end{bmatrix}$, then $A^{10}=$（30）.