King Fahd University of Petroleum and Minerals
College of Sciences,
Prep-Year Math Program

Code 001

Math 002 Final Exam
Term (022)
June 08, 2003
Time Allowed: 2 1/2 Hours

Code 001

STUDENT NAME: KEY

ID #: KEY SECTION # :_____

Important Instructions:

1. All TYPES of CALCULATORS, PAGERS or TELEPHONES are NOT allowed during the examination.
2. Use HB 2.5 pencils only
3. Use a good eraser. Do NOT use the erasers attached to the pencil.
4. Write your name, ID number and Math section number on both the examination paper and the OMR sheet.
5. Detach the OMR sheet carefully.
6. When bubbling your ID number and Math section number, be sure that the bubbles match with the number that you write.
7. Match the Test Code Number already bubbled in your answer sheet with the Test Code Number printed on your question paper.
8. When erasing a bubble, make sure that you do not leave any trace of penciling.
9. Check that the exam paper has 30 questions.

1. If $A=\begin{bmatrix}1 & 1 & 0\\ 0 & 1 & 1\\ 1 & 0 & 1\end{bmatrix}$ and $B=\begin{bmatrix}1 & 0 & 1\\ 1 & 1 & 0\\ 0 & 1 & 1\end{bmatrix}$, then the **cofactor** of the element in the **second row** and the **third column** of the matrix AB is equal to:

a) 2

→ *b*) −1

c) −2

d) 0

e) 4

2. The domain of the function $f(x)=\log(1-x^2)$ is equal to :

a) $(-\infty,\infty)$

b) $(-\infty,-1)\cup(1,\infty)$

c) $(-1,\infty)$

→ *d*) $(-1,1)$

e) $(0,\infty)$

3. The coordinates of one of the foci of the hyperbola

$$\frac{(x-2)^2}{9} - \frac{(y+3)^2}{16} = -1$$

are :

a) $(2,-1)$

b) $(2,9)$

→ *c*) $(2,2)$

d) $(-3,7)$

e) $(-3,5)$

4. If $0 \le x \le 2\pi$, then the sum of all solutions of the equation

$$\sin 4x \cos x - \cos 4x \sin x = 1$$

is equal to :

a) $-\frac{\pi}{3}$

b) $\frac{2\pi}{3}$

c) 2π

d) 5π

→ *e*) $\frac{5\pi}{2}$

5. Let $A=\begin{bmatrix} 2 & -3 \\ -1 & -1 \end{bmatrix}$, $B=\begin{bmatrix} 2 \\ 5 \end{bmatrix}$, and $X=\begin{bmatrix} x \\ y \end{bmatrix}$. If the solution of the system $AX=B$ is $X=CB$, then the matrix C is equal to :

a) $\begin{bmatrix} \frac{1}{5} & -\frac{3}{5} \\ -\frac{1}{5} & -\frac{2}{5} \end{bmatrix}$

b) $\begin{bmatrix} -\frac{1}{5} & -\frac{3}{5} \\ -\frac{1}{5} & \frac{2}{5} \end{bmatrix}$

c) $\begin{bmatrix} \frac{2}{5} & \frac{3}{5} \\ \frac{1}{5} & -\frac{1}{5} \end{bmatrix}$

d) $\begin{bmatrix} \frac{2}{5} & -\frac{3}{5} \\ \frac{1}{5} & -\frac{2}{5} \end{bmatrix}$

e) $\begin{bmatrix} \frac{1}{5} & \frac{3}{5} \\ \frac{1}{5} & -\frac{2}{5} \end{bmatrix}$

6. The exact value of the product $\sin 112.5^\circ \cos 112.5^\circ$ is equal to :

a) $\sqrt{2}$

b) $-\frac{1}{2}$

c) $\frac{\sqrt{2}}{2}$

d) $-\frac{\sqrt{2-\sqrt{2}}}{2}$

e) $-\frac{\sqrt{2}}{4}$

7. The system

$$\begin{cases} x + y = k \\ y + z = 2 \\ x - z = 1 \end{cases}$$ is :

a) independent for $k \neq 3$

b) dependent for $k \neq 3$

→ *c*) inconsistent for $k \neq 3$

d) dependent for $k = 4$

e) independent for $k = 5$

8. Given the vectors $u = \langle 2,-2 \rangle$ and $v = \langle -12,15 \rangle$. If the vector $w = \langle m,n \rangle$ is a **unit** vector in the **opposite** direction of $\frac{1}{2}u + \frac{1}{3}v$, then $m + n =$

→ *a*) $-\frac{1}{5}$

b) $\frac{7}{5}$

c) $\frac{2}{5}$

d) $-\frac{2}{5}$

e) $-\frac{7}{5}$

9. If $A=\begin{bmatrix}-1 & 2 & 3\\ 3 & -1 & 1\end{bmatrix}$ and $B=\begin{bmatrix}0 & 1 & 4\\ -2 & 3 & -3\end{bmatrix}$, then the matrix X for which $3X+2B=X-2A$ is equal to :

a) $\begin{bmatrix}1 & -6 & -7\\ -1 & -2 & 4\end{bmatrix}$

→ *b)* $\begin{bmatrix}1 & -3 & -7\\ -1 & -2 & 2\end{bmatrix}$

c) $\begin{bmatrix}1 & -3 & -14\\ -1 & -4 & 2\end{bmatrix}$

d) $\begin{bmatrix}1 & -3 & -7\\ -2 & -2 & 4\end{bmatrix}$

e) $\begin{bmatrix}2 & -3 & -14\\ -1 & -2 & 2\end{bmatrix}$

10. The graphs of the equations

$$\frac{(x-2)^2}{4}+y^2=1 \quad \text{and} \quad (x-1)^2-y^2=1$$

intersect at :

a) two points

b) four points

c) one point

→ *d)* three points

e) no point

11. Let $\theta = \cos^{-1}(-\frac{3}{5})$ be the direction angle of a vector u. If $\|u\| = 20$, then **the vertical component** of u is equal to :

a) 16

b) 12

c) -16

d) -12

e) 4

12. The value of the constant k for which $3x+7 = 5x+4k = 7x-1$ is equal to :

a) $-\frac{5}{4}$

b) $\frac{9}{4}$

c) $\frac{3}{4}$

d) $\frac{5}{2}$

e) $\frac{11}{4}$

13. The graphs of $y = 2\csc\frac{1}{2}x$ and $y = 2\sin\frac{1}{2}x$, where $0 \le x \le 6\pi$, intersect at :

a) two points

→ *b)* three points

c) one point

d) four points

e) six points

14. If x^2 and y^2 are eliminated from the system

$$\begin{cases}(x+2)^2+(y-3)^2=10\\(x-3)^2+(y+1)^2=13\end{cases}$$

, we get :

a) $x+4y+3=0$

b) $5x+11y+9=0$

c) $11x+4y+3=0$

→ *d)* $5x-4y+3=0$

e) $3x-4y+7=0$

15. The $x-$intercept of the graph of the function

$$f(x)=3+2\log_4(2x-1)$$

is :

a) $(\frac{23}{16},0)$

b) $(\frac{17}{14},0)$

c) $(-\frac{21}{16},0)$

d) $(\frac{11}{4},0)$

e) $(\frac{9}{16},0)$

16. The equation of the **directrix** of the parabola $(3x+6)^2=18y-36$ is :

a) $x=-\frac{7}{2}$

b) $x=-\frac{5}{2}$

c) $y=\frac{7}{2}$

d) $y=\frac{3}{2}$

e) $y=-\frac{5}{2}$

17. The sum of all solutions of $(\log x)^2 = \log_{1/10} x$ is equal to :

a) 1

b) $\frac{101}{100}$

c) 11

d) 21

→ (*e*) $\frac{11}{10}$

18. The measure of the smallest positive angle between the vectors

$$\boldsymbol{u} = -\boldsymbol{i} - 2\boldsymbol{j} \quad \text{and} \quad \boldsymbol{v} = -\boldsymbol{i} + 3\boldsymbol{j}$$

is equal to :

→ (*a*) 135°

b) 45°

c) 120°

d) 150°

e) 225°

19. If $A=\begin{bmatrix} 2 & 1 & -1 & 3 \\ 0 & 1 & 1 & -2 \\ 0 & 3 & 6 & -9 \\ 0 & 1 & 8 & -6 \end{bmatrix}$ and $B=\begin{bmatrix} 2 & 1 & -1 & 3 \\ 0 & 1 & 1 & -2 \\ 0 & 0 & 1 & -1 \\ 0 & 0 & 0 & 3 \end{bmatrix}$, then $|A|=$

a) $-6|B|$

b) $6|B|$

c) $-3|B|$

→ (*d*) $3|B|$

e) $2|B|$

20. The expression $\dfrac{1+\cos 2x}{\sin 2x}$ is identical to:

a) $\tan x$

→ (*b*) $\cot x$

c) $\csc x$

d) $\sec x$

e) $\cos x \sin x$

21. The range of the function $f(x) = -\frac{5}{2} + \frac{3}{2}\sec(x + \pi)$ is equal to:

a) $\left[-\frac{3}{2}, \frac{3}{2}\right]$

b) $\left(-\infty, -\frac{3}{2}\right] \cup \left[\frac{3}{2}, \infty\right)$

→ *c)* $(-\infty, -4] \cup [-1, \infty)$

d) $[-4, -1]$

e) $(-\infty, -1] \cup [1, \infty)$

22. If A and B are 3×3 matrices such that $|A| = 2$ and $|B| = 3$, then which one of the following statements is **FALSE**?

a) $|AB| = 6$

→ *b)* $|A + A^{-1}| = \frac{5}{2}$

c) $|A^{-1}B^{-1}| = \frac{1}{6}$

d) $|2A| = 16$

e) $\left|\frac{1}{3}B\right| = \frac{1}{9}|I|$ where I is the 3×3 identity matrix

23. Let $P(3,1)$ be a point on an ellipse whose foci are at $F_1(-1,4)$ and $F_2(-1,-2)$, then the length L of the major axis and the eccentricity e of the ellipse are :

→ (a) $L = 10$, and $e = \frac{3}{5}$

b) $L = 8$, and $e = \frac{3}{5}$

c) $L = 10$, and $e = \frac{4}{5}$

d) $L = 25$, and $e = \frac{3}{4}$

e) $L = 10$, and $e = \frac{16}{25}$

24. If W is the wrapping function with $W(t) = (\frac{3}{5}, -\frac{4}{5})$, then the x–coordinate of $W(t - \frac{\pi}{2})$ is equal to :

a) $-\frac{3}{4}$

b) $\frac{3}{5}$

c) $\frac{4}{5}$

d) $-\frac{3}{5}$

→ (e) $-\frac{4}{5}$

25. The equation of **one of the asymptotes** of the hyperbola

$$8x^2 - 2y^2 + 32x + 8y - 1 = 0$$

is:

a) $y = 2x - 8$

b) $y = 4x + 7$

→ *c*) $y = 2x + 6$

d) $y = 4x + 9$

e) $y = 2x + 10$

26. The range of the function $f(x) = 2^{-|x|}$ is equal to :

→ *a*) $(0,1]$

b) $(0,\infty]$

c) $[1,\infty)$

d) $[2,\infty)$

e) $[1,2]$

27. The exact value of $\tan\left(\frac{\pi}{4}+\cos^{-1}(-\frac{12}{13})\right)$ is equal to:

a) $\frac{12}{13}$

→ *b)* $\frac{7}{17}$

c) $-\frac{5}{13}$

d) $\frac{13}{17}$

e) $\frac{17}{7}$

28. If the **echelon** form of the augmented matrix of the system

$$\begin{cases} x-3y+z=1 \\ 2x-5y-3z=2 \\ x-4y+z=11 \end{cases} \quad \text{is equal to} \quad \left[\begin{array}{ccc|c} 1 & -3 & 1 & 1 \\ 0 & 1 & p & q \\ 0 & 0 & r & t \end{array}\right],$$

then the sum $p+q+r+t$ is equal to:

a) -9

b) -12

c) 7

→ *d)* -6

e) 8

29. Let $A=\begin{bmatrix}1 & 0 & 7\\ 0 & 1 & 0\\ 0 & 3 & 1\end{bmatrix}$, then the elements of the first row of the **inverse matrix** A^{-1} are:

a) $a_{11}=-3\ ,a_{12}=-21\ \ ,a_{13}=7$

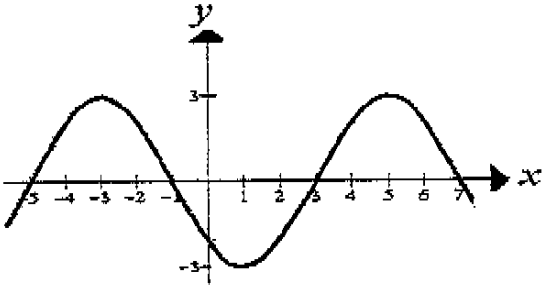
b) $a_{11}=1\ \ \ ,a_{12}=1\ \ \ \ ,a_{13}=-7$

c) $a_{11}=1\ \ \ ,a_{12}=-21\ ,a_{13}=-11$

d) $a_{11}=3\ \ \ ,a_{12}=21\ \ \ ,a_{13}=-7$

→ (*e*) $a_{11}=1\ \ \ ,a_{12}=21\ \ ,a_{13}=-7$

30. The graph in the figure below



is part of the graph of the equation:

a) $y=3\sin(\pi x+\pi)$

b) $y=-3\cos(\frac{\pi}{4}x+\frac{\pi}{4})$

→ (*c*) $y=-3\sin(\frac{\pi}{4}x+\frac{\pi}{4})$

d) $y=-3\sin(\frac{\pi}{2}x+\frac{\pi}{2})$

e) $y=-3\cos(\pi x+\pi)$