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

Code 001

Math 002, Final Exam
Term (021)
January 18, 2003
Time Allowed: 2 1/2 Hours

Code 001

STUDENT NAME: _____

ID #: _____ SECTION # : _____

Important Instructions:

1. **All types of calculators, pagers or telephone 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.**

MATH 002 – T021 (FINAL EXAM) CODE 001

1. The equation in standard form of the ellipse with eccentricity $\frac{2}{5}$ and foci (-1,3) and (3,3) is given by the equation:

a) $\frac{(x+1)^2}{21}+\frac{(y+3)^2}{25}=1$

b) $\frac{(x-1)^2}{25}+\frac{(y-3)^2}{16}=1$

● $\frac{(x-1)^2}{25}+\frac{(y-3)^2}{21}=1$

d) $\frac{(x-1)^2}{25}+\frac{(y-3)^2}{9}=1$

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

2. The solution of the matrix equation:

$$\begin{bmatrix}2 & -3\\ -1 & 2\end{bmatrix}\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}1\\ -1\end{bmatrix}$$

is given by:

● $\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}2 & 3\\ 1 & 2\end{bmatrix}\begin{bmatrix}1\\ -1\end{bmatrix}$

b) $\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}1\\ -1\end{bmatrix}\begin{bmatrix}2 & 3\\ 1 & 2\end{bmatrix}$

c) $\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}-2/7 & 3/7\\ 1/7 & -2/7\end{bmatrix}\begin{bmatrix}1\\ -1\end{bmatrix}$

d) $\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}1\\ -1\end{bmatrix}\begin{bmatrix}-2/7 & 3/7\\ 1/7 & -2/7\end{bmatrix}$

e) $\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}1/2 & 1\\ 1/3 & 1/2\end{bmatrix}\begin{bmatrix}1\\ -1\end{bmatrix}$

3. The following graph is the graph of:

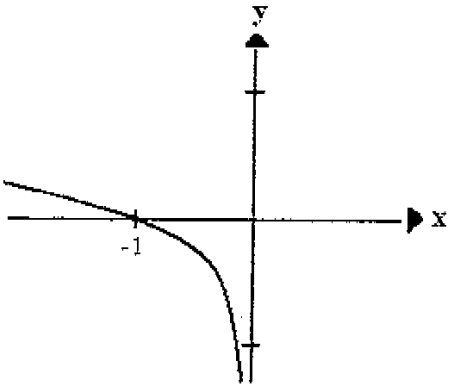
a) $f(x)=\log\ (x-1)$

b) $f(x)=-\log\ |x|$

c) $f(x)=\log\ (1-x)$

● $f(x)=\log\ (-x)$

e) $f(x)=-\log\ (-x)$



4. The maximum value of the function $f(x)=3\sin x - 4\cos x$ is equal to:

a) 4

b) 7

c) 1

d) −1

● 5

5. $\cos^{-1}\left(\frac{-\sqrt{2}}{2}\right)+\sin^{-1}\left(\frac{-\sqrt{3}}{2}\right)=$

a) $\frac{7\pi}{12}$

● $\frac{5\pi}{12}$

c) $\frac{-7\pi}{12}$

d) $\frac{\pi}{4}$

e) $\frac{\pi}{12}$

6. The equation in standard form of the parabola with directrix $x=4$ and focus $(0,-3)$ is given by:

a) $(x-2)^2=-2(y+3)$
b) $(x-2)^2=-8(y+3)$
● $(y+3)^2=-8(x-2)$
d) $(y+3)^2=-2(x-2)$
e) $(y+3)^2=2(x-2)$

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

a) $\sin^2 x$
b) $\csc^2 x$
c) $\tan^2 x$
d) $\cot^2 x$
● $\sec^2 x$

8. The coordinates of one of the foci of the hyperbola $9(y-1)^2-16(x+1)^2=144$ are:

a) $(-1,4)$
● $(-1,6)$
c) $(-3,4)$
d) $(-3,6)$
e) $(-4,6)$

9. $\tan 920^0 =$

a) $-\tan 60^0$
b) $-\tan 200^0$
c) $\tan 40^0$
d) $\tan 20^0$
e) $\tan 30^0$

10. The graphs of the line $3x - y = 0$ and the hyperbola $9x^2 - 4y^2 = 36$:

a) intersect at more than four points
b) intersect at one point only
c) intersect at two points only
d) intersect at four points
e) do not intersect

11. The sum of all values of the constant k for which the two vectors:

$$\mathbf{u} = (k-1)\mathbf{i} + \mathbf{j} \text{ and } \mathbf{v} = 3\mathbf{i} + (k-1)^2\mathbf{j}$$

are perpendicular is equal to:

a) -3
b) 4
c) -2
d) 3
e) -1

12. The length of an arc that subtends a central angle 240° in a circle of radius 15cm is equal to:

a) $28\pi\ cm$
b) $5\pi\ cm$
c) $3\pi\ cm$
d) $20\pi\ cm$
e) $16\pi\ cm$

13. The expression $\sec^2 x + \csc^2 x$ is identical to:

a) $\sin^2 x.\cos^2 x$
b) $\sec^2 x.\csc^2 x$
c) $\sec^2 x.\tan^2 x$
d) $\csc^2 x.\cot^2 x$
e) $\sin^2 x.\ \tan^2 x$

14. If A and B are two matrices of order 4 such that $|A| = 4$ and $|B| = 5$, then the value of $|AB| - 5|B^{-1}|$ is equal to:

a) 5
b) −5
c) 19
d) 21
e) 45

15. Given the vectors $\mathbf{u} = \langle 3, -5 \rangle$, and $\mathbf{v} = \langle -3, -1 \rangle$. Then the magnitude M and the direction angle θ of the vector $\mathbf{u} + \mathbf{v}$ are:

a) $M = 6,\ \theta = \frac{3\pi}{2}$

b) $M = 4,\ \theta = \frac{3\pi}{4}$

c) $M = 6,\ \theta = \frac{\pi}{2}$

d) $M = 4,\ \theta = \pi$

e) $M = 6,\ \theta = \frac{\pi}{4}$

16. The equation of one of the asymptotes of the hyperbola $4x^2 - y^2 - 8x - 2y - 13 = 0$ is:

a) $y = 2x + 7$

b) $y = 2x - 3$

c) $y = 2x - 8$

d) $y = x - 4$

e) $y = 2x + 6$

17. The sum of all solutions of the logarithmic equation $\log x^3 = (\log x)^2$ is equal to:

a) 1001

b) 101

c) 11

d) 1

e) 3

18. If (x, y) is a solution of the system:

$$2\sqrt{2}x + 3\sqrt{5}y = 7$$
$$3\sqrt{2}x - \sqrt{5}y = -17$$

Then y is equal to:

a) $-2\sqrt{5}$
b) $-\sqrt{5}$
c) $4\sqrt{5}$
d) $2\sqrt{5}$
e) $\sqrt{5}$

19. $\cos 13^0 \cos 9.5^0 - \sin 13^0 \sin 9.5^0 =$

a) $\frac{1}{2}\sqrt{\sqrt{2}-1}$
b) $\frac{1}{2}\sqrt{2-\sqrt{2}}$
c) $\frac{1}{2}\sqrt{2+\sqrt{2}}$
d) $\frac{\sqrt{2}}{2}$
e) $-\frac{\sqrt{2}}{2}$

20. Given the matrices:

$$A = \begin{bmatrix} 3 & 2 & 0 \\ 3 & 5 & 1 \end{bmatrix},\ B = \begin{bmatrix} 5 & 0 \\ -3 & 1 \\ 0 & -1 \end{bmatrix},\ \text{and}\ C = \begin{bmatrix} 3/2 & 1 \\ 0 & 3/2 \end{bmatrix}.$$

Then the matrix $AB - 2C$ is equal to:

a) $\begin{bmatrix} 6 & -1 \\ 3 & 1 \end{bmatrix}$
b) $\begin{bmatrix} 6 & 1 \\ 0 & 0 \end{bmatrix}$
c) $\begin{bmatrix} 6 & 2 \\ 1 & 1 \end{bmatrix}$
d) $\begin{bmatrix} 0 & 6 \\ 1 & 0 \end{bmatrix}$
e) $\begin{bmatrix} 6 & 0 \\ 0 & 1 \end{bmatrix}$

21. The solution set of the equation $4^x-(3)(2^x)+2=0$ contains:

a) exactly one integer
● exactly two integers
c) one integer and one irrational number
d) two irrational numbers
e) no real numbers

22. The echelon form of the matrix $\begin{bmatrix} 1 & -3 & 2 & -4 \\ 2 & 0 & -2 & 4 \\ 0 & 4 & 2 & 11 \end{bmatrix}$ is given by:

● $\begin{bmatrix} 1 & -3 & 2 & -4 \\ 0 & 1 & -1 & 2 \\ 0 & 0 & 1 & 1/2 \end{bmatrix}$

b) $\begin{bmatrix} 1 & -3 & 2 & -4 \\ 0 & 1 & 4 & 3 \\ 0 & 0 & 1 & 1/2 \end{bmatrix}$

c) $\begin{bmatrix} 1 & -3 & 2 & -4 \\ 0 & 1 & -1 & 2 \\ 0 & 0 & 1 & 3/2 \end{bmatrix}$

d) $\begin{bmatrix} 1 & -3 & 2 & -4 \\ 0 & 2 & 8 & 6 \\ 0 & 0 & -18 & -9 \end{bmatrix}$

e) $\begin{bmatrix} 1 & -3 & 2 & 4 \\ 0 & 1 & 8 & 6 \\ 0 & 0 & 1 & 1/2 \end{bmatrix}$

23. If $A=\begin{bmatrix} 1 & 1 & 4 \\ 2 & 3 & 6 \\ -1 & -1 & 2 \end{bmatrix}$, then the sum of the elements in the second row of A^{-1} is equal to:

a) $-\frac{2}{3}$

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

● $-\frac{1}{3}$

d) -4

e) 2

24. The value of the constant k for which the system of equations:

$$x + kz = 1$$
$$y + z = 2$$
$$2x + y = 5$$

has **no solution**, is equal to:

a) $-3/2$
b) $-5/2$
c) $3/2$
● $-1/2$
e) -1

25. The expression $(\log_3 64)(\log_4 \sqrt{3}) - (\sqrt[3]{10})^{-3\log 5}$ is equal to:

a) $\frac{32}{15}$
b) $\frac{21}{25}$
c) $\frac{12}{13}$
d) $\frac{16}{5}$
● $\frac{13}{10}$

26. Which of the following function has the graph given below on the interval $\left[\frac{\pi}{4}, \frac{7\pi}{12}\right]$:

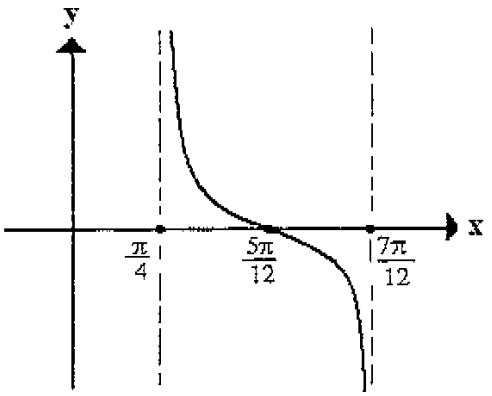
a) $y=\frac{3}{2}\cot\left(2x+\frac{\pi}{4}\right)$

b) $y=-\frac{3}{2}\cot\left(3x+\frac{\pi}{4}\right)$

c) $y=\frac{3}{2}\cot\left(3x+\frac{\pi}{4}\right)$

d) $y=-\frac{3}{2}\cot\left(2x+\frac{\pi}{4}\right)$

e) $y=\frac{3}{2}\cot\left(3x+\frac{5\pi}{12}\right)$



27. The domain D and the range R of the function $f(x)=-3\sin^{-1}(2x-1)$ are given by:

a) $D=[0,\ 4]$; $R=\left[\frac{-3\pi}{2},\ \frac{3\pi}{2}\right]$

b) $D=[0,\ 1]$; $R=[-\pi,\ \pi]$

c) $D=[0,\ 1]$; $R=\left[\frac{-\pi}{3},\ \frac{\pi}{3}\right]$

d) $D=[-2,\ 2]$; $R=\left[\frac{-3\pi}{2},\ \frac{3\pi}{2}\right]$

e) $D=[0,\ 1]$; $R=\left[\frac{-3\pi}{2},\ \frac{3\pi}{2}\right]$

28. The graph of the function $y = -7\sec\frac{1}{2}\pi x$ in the interval $(1,3)$ will:

a) increase on $(1,2)$, and decrease on $(2,3)$
b) increase on $(1,3)$
c) decrease on $(1,3)$
● decrease on $(1,2)$, and increase on $(2,3)$
e) increase on $\left(1,\frac{3}{2}\right)$, and decrease on $\left(\frac{3}{2},3\right)$

29. The value of the determinant $\begin{vmatrix} 2 & 0 & 0 & 1 \\ 0 & 2 & 0 & 0 \\ 0 & 0 & 3 & 0 \\ 1 & 0 & 0 & 1 \end{vmatrix}$ is equal to:

● 6
b) 12
c) −12
d) 0
e) 1

30. The number of solutions of the equation $\sqrt{2}\sin 2x = 1$ in the interval $[0, 2\pi)$ is equal to:

a) 2
● 4
c) 8
d) 6
e) 1