➢ Differential and Integral Calculus

(1)Solve the equations:

(1) $2x + 5 = 0$ (2) $\frac{2}{3}x - 3 = 0$ (3) $2x = 0$

(4) $\frac{1}{3}x^2 - 3 = 0$ (5) $\frac{1}{2}x^2 + 2 = 0$ (6) $\frac{1}{2}x^3 - 2x = 0$

(7) $x^2 - 3x + 2 = 0$ (8) $x^3 - 3x^2 + 2x = 0$ (9) $x^4 - x = 0$

(10) $2^x - 3 = 0$ (11) $2^x - 5^x = 0$ (12) $2^x = \frac{1}{2}3^x$

(13) $4 - 2^x = 1$ (14) $2^{x+1} - 5^x = 0$ (15) $2^{x-1} = \frac{1}{2}3^{x+1}$

(16) $(x - 1)2^x = 0$ (17) $(x + 1)4^x = 3^x$ (18) $2^x + 3^x = 0$

(19) $\ln(x - 1) = 0$ (20) $\log x = 1$ (21) $\ln(x + 2) = 3$

(22) $\log_3 x = -2$ (23) $\log_{\frac{3}{4}}(x + 1) = 2$ (24) $x \ln(x - 3) = 0$

(2)Find the first derivative of each of the following functions:

(1) $y = x^4 + 2x^5 + 3$ (2) $y = 8 - 3x + 2x^6$

(3) $y = x^{-3} + \frac{2}{x^4} + \sqrt{x}$ (4) $y = 2x^{-2} + \frac{3}{x^5} - \sqrt[3]{x}$

(5) $y = 3x^4 + 2^x + 4x$ (6) $y = (\frac{2}{3})^x - x^5 - \frac{2}{3}$

(7) $y = x^4 . 2^x + 4x$ (8) $y = 3^x . x^4 - \frac{x}{3} + \frac{1}{4}$

(9) $y = x^3 + \frac{1}{3^x} + 2\log x$ (10) $y = x^{-3} + \frac{1}{2^x} - 3\ln x$

(11) $y = x^5 . \log x + \log_5 x$ (12) $y = x^{-3} . \ln x - \log_4 x$

(13) $y = (x^3 + \ln x)^9 + x^{-8}$ (14) $y = (x^2 + 2^x)^8 + \frac{1}{\sqrt{x}}$

(15) $y = (x^2 + \log x)^{-3} + 6$ (16) $y = (x^4 - x^2)^4 + \ln 8$

(17) $y = x^{\frac{3}{5}} - (x + \log x)^7$ (18) $y = 2(5^x + \ln x)^6 - \frac{1}{8}$

(19) $y = 5^{2x} + 3^{x+1}$ (20) $y = 3^{3x} + 2^{x+2}$

(21) $y = 2\sin x + 3\cos x$ (22) $y = 4\cos x - 2\sin x$

(23) $y = x^3 . \sin x - 2\cos x$ (24) $y = x^4 . \cos x + \frac{2}{3}\sin x$

(25) $y = \sin x + \log x$ (26) $y = \cos x - \log_5 x$

(27) $y = \sin x . \log x + 8^x$ (28) $y = \cos x . \ln x - (\frac{1}{2})^x$

(29) $y = (\cos x)^8 + 2\sin^3 x$ (30) $y = (\sin x)^5 - 3\cos^{-2} x$

(31) $y = \ln x^8 + [\ln x]^8$
(32) $y = \ln x^7 + [\log_5 x]^{-6}$
(33) $y = \sqrt{x + \sqrt{1 + x}}$
(34) $y = \sqrt[4]{x + \sqrt{x - 1}}$
(35) $y = 2\sin x + \frac{x^3}{\ln x}$
(36) $y = 3\cos x + \frac{x^4}{\log x}$
(37) $y = \frac{\ln x}{\log x} + \frac{\cos x}{\sin x}$
(38) $y = \frac{\log x}{\ln x} + \frac{\sin x}{\cos x}$
(39) $y = \frac{2^x}{3^x} + \ln\frac{1}{\sin x}$
(40) $y = \frac{3^x}{4^x} + \log\frac{1}{\cos x}$

(3)Find y ` where:

(1) $y = 2^{x^3} + \log(x^5 + 1)$
(2) $y = 3^{x^2} - \ln(1 + x^4)$
(3) $y = 5^{\sqrt{x}} + \sin x^3$
(4) $y = 4^{\sqrt[3]{x}} + 3\cos x^4$
(5) $y = 6 + x^3.\sin(2x + 3)$
(6) $y = \frac{3}{2} + x^4.\cos(3 - 4x)$
(7) $y = 3x - \ln(8^x + x^8)$
(8) $y = \frac{1}{2}x + \log(2^x + \ln x)$
(9) $y = 3x + \sin(x + \log x)$
(10) $y = \frac{3}{4}x - \cos(x.3^x)$
(11) $y = 3^{\sin x} + \cos\sqrt{x}$
(12) $y = 8^{\cos x} - 2\sin\ln x$

(4)Find y` and y`` from the following functions:

(1) $y = 2x + 1$
(2) $y = 3^x + x^4$
(3) $y = \sin x\,.\log x$
(4) $y = \cos x\,.\ln x$
(5) $y = \frac{x}{2} + \frac{2}{x}$
(6) $y = \frac{3}{4}x + \sqrt{x}$

(5) Find y` at the given points in the following:

(1) $y = x^3 + \sin x$ at x = 0
(2) $y = 3^x + \ln x$ at x = 1
(3) $y = \cos x + \ln x$ at x = 0
(4) $y = x^2.2^x$ at x = 2

(6)Find the extrema of the following functions:

(1) $f(x) = 2x + 1$
(2) $f(x) = 3^x + 2$
(3) $f(x) = \log x$
(4) $f(x) = \ln x$
(5) $f(x) = \frac{x}{2} + \frac{2}{x}$
(6) $f(x) = \frac{3}{4} + \frac{1}{1+x^2}$
(7) $f(x) = 2x^2 - 8x + 1$
(8) $f(x) = 4x - x^2$
(9) $f(x) = x^3 - 12x$
(10) $f(x) = 3 + (x - 2)^4$
(11) $f(x) = 2x^3 - 6x$
(12) $f(x) = x^3 - 3x^2 - 9x$
(13) $f(x) = x + \cos x$
(14) $f(x) = 3x - (x - 2)^3$

(7)Find the following integrals:

(1) $\int (x^3 + 2x^2 - 1)\, dx$

(2) $\int (2x^4 - 3x^2 + 3)\, dx$

(3) $\int (x^{-3} + \sqrt{x} + \frac{3}{2})\, dx$

(4) $\int (x^{-2} + \frac{2}{x^3} + \frac{2}{3})\, dx$

(5) $\int (3^x + 5^x + x)\, dx$

(6) $\int (4^x - 2^x + x^3)\, dx$

(7) $\int [(\frac{3}{5})^x + \frac{2^x}{3^x}]\, dx$

(8) $\int [(\frac{2}{3})^x + \frac{4^x}{3^x}]\, dx$

(9) $\int [x^4 + \frac{1}{3^x}]\, dx$

(10) $\int [\frac{1}{4^x} - x^{-3}]\, dx$

(11) $\int [2 - x^3]^2\, dx$

(12) $\int [3 - x^2]^2\, dx$

(13) $\int [1 + 3^x]^2\, dx$

(14) $\int [2 - 3^x]^2\, dx$

(15) $\int [2^x + 3^x]^2\, dx$

(16) $\int [4^x - 3^x]^2\, dx$

(17) $\int 3x^2 [2 - x^3]^9\, dx$

(18) $\int x[2 + 3x^2]^8\, dx$

(19) $\int 3^x [2 + 3^x]^9\, dx$

(20) $\int e^x [2 + 3e^x]^8\, dx$

(21) $\int 2x.3^{x^2}\, dx$

(22) $\int 3x^2.4^{x^3}\, dx$

(23) $\int \frac{1}{\sqrt{x}} e^{\sqrt{x}} dx$

(24) $\int \frac{1}{x^2} e^{\frac{1}{x}} dx$

(25) $\int [3x + \cos 2x]\, dx$

(26) $\int [2x - \sin 3x]\, dx$

(27) $\int [3^{2x} - 2\cos 3x]\, dx$

(28) $\int [2^{3x} + 3\sin 2x]\, dx$

(29) $\int \frac{3}{x-2}\, dx$

(30) $\int \frac{2}{x+3}\, dx$

(31) $\int \frac{1}{2x+1}\, dx$

(32) $\int \frac{3}{2x-5}\, dx$

(33) $\int \frac{x}{3+x^2}\, dx$

(34) $\int \frac{x}{x^2-4}\, dx$

(35) $\int \frac{1+\cos x}{x+\sin x}\, dx$

(36) $\int \frac{\sin x}{2+\cos x}\, dx$

(37) $\int \frac{e^x}{1+e^x}\, dx$

(38) $\int \frac{1+e^{2x}}{2x+e^{2x}}\, dx$

(39) $\int \frac{x}{1+x}\, dx$

(40) $\int \frac{x}{x-2}\, dx$

(41) $\int \frac{x}{3-4x+x^2}\, dx$

(42) $\int \frac{x+2}{x^2+4x+3}\, dx$

(43) $\int \frac{x+1}{x^2-9}\, dx$

(44) $\int \frac{x-2}{x^2+4x}\, dx$

(45) $\int \frac{x}{4-4x+x^2}\, dx$

(46) $\int \frac{x-1}{x^2+4x+4}\, dx$

(47) $\int \frac{4}{x^2+6x+9}\, dx$

(48) $\int \frac{2}{x^2+4x+4}\, dx$

(49) $\int \frac{x}{\sqrt{3+x^2}}\, dx$

(50) $\int \frac{x}{\sqrt{x^2-3}}\, dx$

(51) $\int 3\ln x\, dx$

(52) $\int 2\log x\, dx$

(53) $\int \ln(2 + x)\, dx$

(54) $\int \log(x - 1)\, dx$

(55) $\int x \log x\, dx$

(56) $\int x \ln x\, dx$

(57) $\int (x+1)\ln x\,dx$
(58) $\int (x+2)\log x\,dx$
(59) $\int x.\sin 2x\,dx$
(60) $\int x.\cos 3x\,dx$
(61) $\int x.3^x\,dx$
(62) $\int x.4^x\,dx$
(63) $\int (x+1)3^x\,dx$
(64) $\int (x-2)4^x\,dx$
(65) $\int_0^2 (x^3+2)\,dx$
(66) $\int_0^1 (3+x^3)\,dx$
(67) $\int_{-1}^1 (2x+x^3)\,dx$
(68) $\int_{-2}^2 (3+x^2)\,dx$
(69) $\int_1^2 \ln x\,dx$
(70) $\int_1^3 \log x\,dx$
(71) $\int_0^1 x.2^x\,dx$
(72) $\int_0^\pi x.\cos x\,dx$
(73) $\int_0^1 \frac{3}{x+2}dx$
(74) $\int_0^2 \frac{2}{3x+1}dx$
(75) $\int_0^1 \frac{x+1}{x^2-5x+6}dx$
(76) $\int_1^2 \frac{3}{x^2+2x}dx$

➢ Matrices

(1)If $A=\begin{bmatrix}2 & 3\\ 1 & 1\end{bmatrix}$, $B=\begin{bmatrix}2 & 0\\ 3 & -1\end{bmatrix}$ and $C=\begin{bmatrix}3 & 3\\ 4 & 1\end{bmatrix}$

Find A + B, A + B + C, A + 2B + 3C, 2A– 3B – 4C, A`, B`, C`, AB, BA, AC, ABC, |A|, |B|, |C|, |AB|, |BA|, |AC|

(2)If $A=\begin{bmatrix}1 & 0 & 2 & -1\\ 2 & 3 & 1 & 2\end{bmatrix}$, $B=\begin{bmatrix}1 & 2\\ 2 & 1\\ 2 & 0\\ 0 & 1\end{bmatrix}$. Find AB, BA, A`, B`, A`B`, (BA)`.

(3)If $A=\begin{bmatrix}2 & 3 & 1\\ 1 & 0 & 8\\ -2 & 4 & 1\end{bmatrix}$ a nd $B=\begin{bmatrix}3 & 2 & 1\\ 1 & 5 & 6\\ 0 & 4 & 1\end{bmatrix}$

Find A + B, A – B, AB, BA, |A|, |B|, |A + B|, |AB|

(4)Find the inverse of the following matrices, if exists:

$$A=\begin{bmatrix}2 & 3\\ 1 & 1\end{bmatrix},\ B=\begin{bmatrix}2 & 0\\ 3 & 1\end{bmatrix},\ C=\begin{bmatrix}3 & 3\\ 1 & 1\end{bmatrix},\ D=\begin{bmatrix}1 & 0 & 2 & -1\\ 2 & 3 & 1 & 2\end{bmatrix}$$

$$E=\begin{bmatrix}3 & 2 & 1\\ 1 & 5 & 6\\ 0 & 4 & 1\end{bmatrix},\ F=\begin{bmatrix}-2 & 2 & 1\\ 1 & 3 & 6\\ 0 & 1 & 1\end{bmatrix},\ G=\begin{bmatrix}1 & 2 & 1\\ 2 & 4 & 2\\ 0 & 1 & 1\end{bmatrix}$$

(5)Find the eigenvalues and eigenvectors of the following matrices:

$$A=\begin{bmatrix}2 & 1\\ 0 & 4\end{bmatrix},\ B=\begin{bmatrix}0 & 1\\ 3 & 2\end{bmatrix},\ C=\begin{bmatrix}1 & 3\\ 1 & -1\end{bmatrix},\ D=\begin{bmatrix}0 & 8\\ 2 & 0\end{bmatrix}$$

(6)Find the eigenvalues and eigenvectors of the following matrices:

$$A=\begin{bmatrix}2 & -2 & 3\\ 1 & 1 & 1\\ 1 & 3 & -1\end{bmatrix},\quad B=\begin{bmatrix}1 & -1 & 0\\ 2 & 3 & 2\\ 1 & 1 & 2\end{bmatrix},\quad C=\begin{bmatrix}0 & 0 & 1\\ 1 & 0 & -1\\ 0 & 1 & 1\end{bmatrix}$$

$$D=\begin{bmatrix}2 & 0 & -2\\ 0 & 4 & 0\\ -2 & 0 & 5\end{bmatrix},\quad E=\begin{bmatrix}3 & -2 & -5\\ 4 & -1 & -5\\ -2 & -1 & -3\end{bmatrix},\quad F=\begin{bmatrix}2 & 0 & 3\\ 0 & 3 & 1\\ 0 & 0 & -1\end{bmatrix}$$

➢ Linear Systems

(1)Write the augmented matrix of each of the following linear systems and discuss its consistence:

(a) $x + y = 4$ $2x - y = 5$	(b) $x + y = 5$ $x - y = -1$	(c) $x + y = 0$ $x - y = 4$
(d) $x + 2y = 5$ $2x - y = 1$ $3x + y = 6$	(e) $2x + y = 3$ $2x - y = 1$ $x + 2y = 8$	(f) $x + 3y = 7$ $2x - y = 0$ $x + 2y = 8$
(g) $x + y - z = 4$ $2x - y + 3z = 5$ $-x - y + z = -4$	(h) $x + 2y - z = 2$ $2x - y + 3z = 4$ $-x + y + 2z = 4$	(i) $x + y - 2z = 2$ $2x - y + z = 3$ $-x - y + 4z = 0$

(2)Solve the following linear systems:

(a) x + y = 3 3x – y = 1	(b) 2x + y = 6 3x – y = 4	(c) x + y = 4 4x – y = 1
(d) x + y + z = 5 2x – y + z = 3 2x + 2y – z = 7	(e) x + y – z = 4 x – y + 2z = 3 x + y – 2z = 3	(f) 2x + y + 2z = 8 x – y + z = 1 2x + y – z = 5
(g) x – y + 2z = 6 x + y + 2z = 10 x + y – z = 2	(h) 2x + y + 2z = 8 x – y + z = 1	(i) x + y – z = 0 x – y + 2z = 0 x + y – 2z = 0

(3)Solve the following linear system:

$x_1 + x_2 + x_3 + x_4 = 10, \quad x_1 - x_2 + 2x_3 - x_4 = 1$

$2x_1 + x_2 - x_3 + x_4 = 5, \quad x_1 + x_2 + 2x_3 - 2x_4 = 1$

➢ Rate of change

(1)A medicine in the blood decreases according to equation $y_0 - y = ct$.
If c = 5 units / hour and the initial quantity $y_0 = 150$ units. Find

(a)The time at which 25 % of medicine exists in the blood.
(b)The time at which 50 % of medicine exists in the blood.
(c)The time at which 75 % of medicine exists in the blood.
(d)The time at which there is no medicine in the blood.
(e)The quantity of medicine exists in blood after 3 hours.

(2)A medicine in the blood decreases according to equation $y_0 - y = ct$.
If c = 4 units / hour and the initial quantity $y_0 = 200$ units. Find

(a)The time at which 25 % of medicine exists in the blood.
(b)The time at which 50 % of medicine exists in the blood.
(c)The time at which 75 % of medicine exists in the blood.
(d)The time at which there is no medicine in the blood.
(e)The quantity of medicine exists in blood after 4 hours.

(3)A drug in the blood decreases according to equation $\sqrt{y_0} - \sqrt{y} = \frac{1}{2}ct$. If c = 4 units / hour and the initial quantity $y_0 = 144$ units. Find

(a)The time at which 80 % of drug exists in the blood.
(b)The time at which 75 % of drug exists in the blood.

(c)The time at which 60 % of drug exists in the blood.
(d)The time at which 50 % of drug exists in the blood.
(e)The time at which 25 % of drug exists in the blood.
(f)The time at which there is no drug in the blood.
(g)The quantity of drug exists in blood after 2 hours.

(4)A drug in the blood decreases according to equation $\sqrt{y_0} - \sqrt{y} = \frac{1}{2}ct$. If c = 4 units / hour and the initial quantity $y_0 = 256$ units. Compute

(a)The time at which 80 % of drug exists in the blood.
(b)The time at which 75 % of drug exists in the blood.
(c)The time at which 50 % of drug exists in the blood.
(d)The time at which 25 % of drug exists in the blood.
(e)The time at which there is no drug in the blood.
(f)The quantity of drug exists in blood after 3 hours.

(5)A drug in the blood decreases according to equation $\sqrt{y_0} - \sqrt{y} = \frac{1}{2}ct$. If c = 6 units / hour and the initial quantity $y_0 = 144$ units. Calculate

(a)The time at which 80 % of drug exists in the blood.
(b)The time at which 60 % of drug exists in the blood.
(c)The time at which 50 % of drug exists in the blood.
(d)The time at which 22 % of drug exists in the blood.
(e)The time at which there is no drug in the blood.

➢ Dilution Problem

(1) If a medicine exists in 3 dosage forms :
First type of concentration: 1 mg /tablet
Second type of concentration: 2 mg /tablet
Third type of concentration: 4 mg /tablet
If the pharmacist wanted to produce 20 tablets containing 3 mg / tablet by mixing whole tablets of each type. Find all possible solutions.

(2) If a medicine exists in 3 dosage forms :
First type of concentration: 2 mg /tablet
Second type of concentration: 4 mg /tablet
Third type of concentration: 5 mg /tablet
If the pharmacist wanted to produce 16 tablets containing 3 mg / tablet by mixing whole tablets of each type. Find all possible solutions.

(3) If a medicine exists in 3 dosage forms :
First type of concentration: 1 mg /tablet
Second type of concentration: 3 mg /tablet
Third type of concentration: 5 mg /tablet
If the pharmacist wanted to produce 20 tablets containing 2 mg / tablet by mixing whole tablets of each type. Find all possible solutions.

(4) If a medicine exists in 3 dosage forms :
First type of concentration: 2 mg /tablet
Second type of concentration: 4 mg /tablet
Third type of concentration: 6 mg /tablet
If the pharmacist wanted to produce 25 tablets containing 3 mg / tablet by mixing whole tablets of each type. Find all possible solutions.

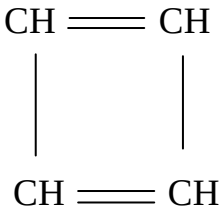
(5) If a medicine exists in 3 dosage forms :
First type of concentration: 2 mg /tablet
Second type of concentration: 4 mg /tablet
Third type of concentration: 6 mg /tablet
If the pharmacist wanted to produce 24 tablets containing 5 mg / tablet by mixing whole tablets of each type. Find all possible solutions.

(6) If a medicine exists in 3 dosage forms :
First type of concentration: 1 mg /tablet
Second type of concentration: 4 mg /tablet
Third type of concentration: 5 mg /tablet
If the pharmacist wanted to produce 20 tablets containing 3 mg / tablet by mixing whole tablets of each type. Find all possible solutions.

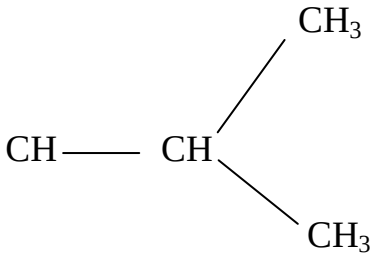
➢ Energy Levels

Draw the molecular graph of the following chemical compounds. Also write its matrix and determine the eigenvalues (energy levels):

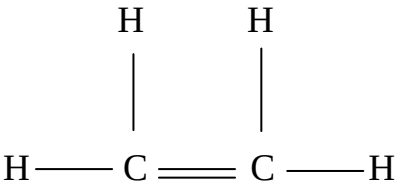
(1)Cyclobutidiene



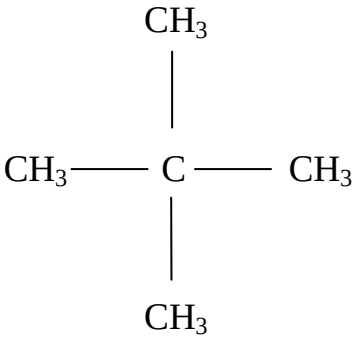
(2)Propane



(3)Ethene



(4)Isopentane



➢ Curve Fitting

(1)Find the curves $y = a + bx$, $y = a\ e^{bx}$ and $y = a\ x^{b}$ that fit data:

(i) (2, 3), (4, 4), (6, 7), (8, 9), (10, 12)

(ii) (1, 2), (2, 3), (3, 5), (4, 8), (5, 9)

(iii) (1, 2), (1.5, 3), (2, 4.4), (2.5, 6), (3, 8)

(iv) (0.2, 1.4), (0.4, 2), (0.6, 2.5), (0.8, 3), (1, 4)

(v) (10, 1), (20, 3), (30, 4), (40, 5), (50, 8)

(2)If the quantity of a drug in the blood decreases according to the data:

Time: t	0	1	2	3	4	5	Hours
Quantity: y	40	35	28	18	7	1	Units

Find the curves: $y = a + bt$ and $y = a\ e^{bt}$ that fit the data.

(3)If the quantity of a drug in the blood decreases according to the data:

Time: t	0	1	2	3	4	5	Hours
Quantity: y	50	40	28	15	4	1	Units

Find the curves: $y = a + bt$ and $y = a\ e^{bt}$ that fit the data.

(4)If the quantity of a drug in the blood decreases according to the data:

Time: t	0.5	1	1.5	2	2.5	3	Hours
Quantity: y	20	12	7	4	2	1	Units

Find the curves: $y = a + b \ln t$ and $y = a\ t^{b}$ that fit the data.

Algebra Of Matrices Using Calculator

Input Matrix A

Mode	6	1 Or 2…6	Write the numbers	AC
		Chose the type of A		

Computing |A|

Shift	4	7	Shift	4	3	)	=
		det(		Matrix A			

Computing A^{-1}

Shift	4	3	x^{-1}	=
		Matrix A		

Computing A^2

Shift	4	3	x^2	=
		Matrix A		

Computing A^3

Shift	4	3	Shift	x^2	=
		Matrix A			

Input Two Matrices A and B

After writing the matrix A as above, input B as follows:

Shift	4	1	2	1 or 2…6	Write the numbers	AC
			Matrix B	chose the dimension		

Computing A + B

Shift	4	3	+	Shift	4	4	=
		Matrix A				Matrix B	

Computing AB

Shift	4	3	x	Shift	4	4	=
		Matrix A				Matrix B	

Curve Fitting Using Calculator

The line: y = a + bx

			X	Y	
Mode	3	2			AC
		Chose the type of curve	Input the data		

		Edit	Ins	
Shift	1	3	1	

		Reg	A	
Shift	1	7	1	=

		Reg	B	
Shift	1	7	2	=

This procedure is used for computing the curves:

$y = a + b\ln x$, $y = a\ t^{b}$ and $y = a\ e^{bt}$

To obtain another curve using the saved data:

				X	Y
Shift	1	2			
		Data		Data appearance	

Shift	1	1	1,…,8	AC
		Type	Chose the curve	

		Edit	Ins
Shift	1	3	1

		Reg	A	
Shift	1	7	1	=

		Reg	B	
Shift	1	7	2	=

Academic Year: 2013 – 2014 Semester: Autumn Date: January 9, 2014 Duration Time: **2** Hours	Modern University For Technology & Information Faculty of Pharmacy	Mathematics: OCM 103 Final Exam Examiner: Dr. Mohamed Eid
Answer All Questions		Total Mark: 60

Question 1

Find **y`** where:

(a) $y = 3x^3 + 4x + 3$ (b) $y = \cos x \,.\, \ln x$ (c) $y = \frac{3}{5} - x \log x$

(d) $y = [2^x + \sin x]^{-4}$ (e) $y = 4^{2x} - \log x$ (f) $y = \frac{\sin x}{\cos x} - 2$

Question 2

Find the integrals:

(a) $\int (x^4 + \frac{1}{x})dx$ (b) $\int (2^x + \sin x)\, dx$ (c) $\int \frac{2x}{(3+x^2)^8} dx$

(d) $\int \frac{x+2}{x^2-3x-4} dx$ (e) $\int x . \ln x \, dx$ (f) $\int_0^2 (x^2 + 4)\, dx$

Question 3

(a) If $A = \begin{bmatrix} 1 & 2 & -2 \\ 2 & 1 & 0 \\ 0 & 1 & -3 \end{bmatrix}$. Find, if possible, 2A, |A|, A. A^t.

(b) Find the eigenvalues and the eigenvectors of : $A = \begin{bmatrix} 1 & 2 \\ 1 & 2 \end{bmatrix}$

Question 4

(a)If $A = \begin{bmatrix} 2 & 1 & 3 \\ 1 & 0 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 3 \\ 0 & 2 \\ 2 & 4 \end{bmatrix}$.

Find, if possible, A + B, |A|, A + B^t, B.A, |AB|.

(b) If $A = \begin{bmatrix} 2 & 1 \\ 1 & -4 \end{bmatrix}$. Show that: $A^2 + 2A = 9I$

(c) Write the linear system in matrix form :

x – y + z = 1, 2x + y + z = 2, 3x + 2z = 4.

Good luck Dr. Mohamed Eid

Academic Year: 2013 – 2014 Semester: Autumn Date: January, 2014 Duration Time: **2** Hours	Modern University For Technology & Information Faculty of Pharmacy	Mathematics: OCM 103 Final Exam Examiner: Dr. Mohamed Eid
Answer All Questions		Total Mark: 60

Question 1

Find **y`** where:

(a) $y = \frac{3}{x^3} + 3x - 3$ (b) $y = \sin x \,.\, \log x$ (c) $y = \ln^6 x + \ln x^5$

(d) $y = [2^x + \ln x]^5$ (e) $y = 3^{2x} + \frac{1}{\sin x}$ (f) $y = \frac{2}{3} + \sin^{-3} x$

Question 2

Find the integrals:

(a) $\int (x^3 + \frac{1}{x^3}) dx$ (b) $\int (4^x + 2\sin x)\, dx$ (c) $\int \frac{x+2}{x^2-4x} dx$

(d) $\int x.\sin x \, dx$ (e) $\int \ln x \, dx$ (f) $\int_0^1 (x^2 - 1)^2 \, dx$

Question 3

(a)If $A = \begin{bmatrix} 1 & -1 & 2 \\ 1 & 3 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & -1 \\ 3 & 2 \\ 2 & 1 \end{bmatrix}$.

Find, if possible, A + B, |A|, A + B^t, A.B.A, |A.B|.

(b) Find the eigenvalues and the eigenvectors of : $A = \begin{bmatrix} 1 & 9 \\ 1 & -1 \end{bmatrix}$

(c) If $B = \begin{bmatrix} -1 & 3 \\ 3 & 1 \end{bmatrix}$. Show that: $B^2 = 9I$

Question 4

(a)If $A = \begin{bmatrix} 2 & -1 & -2 \\ 1 & 1 & 0 \\ 3 & 0 & -2 \end{bmatrix}$. Find, |A|, A.A, A. A^t.

(b) Write the linear system in matrix form :

x – 2y + 3z = 2, 2x + y + z = 0, 3y + z = 3.

Good luck Dr. Mohamed Eid

Academic Year: 2012 – 2013 Semester: Autumn Date: 31 – 12 – 2012 Duration Time: **2** Hours	Modern University For Technology & Information Faculty of Pharmacy	Mathematics: OCM 103 Final Exam Examiner: Dr. Mohamed Eid
Answer All Questions		Total Mark: 60

[1] Find **y`** where:

(a) $y = 3x^3 + 3^x + 3$ (b) $y = \cos x \,.\, \log x$

(c) $y = [\sin x + \ln x]^8$ (d) $y = \frac{3}{\sin x} + (\frac{2}{3})^x$

[2]Find the integrals: (a) $\int (x^2 + \frac{1}{x^2} + \frac{1}{x})dx$ (b) $\int (3^x + \cos x)\, dx$

(c) $\int (x.\ln x)dx$ (d) $\int \frac{x}{x^2 - 3x - 4}\, dx$ (e) $\int_2^3 (3x^2 + 1)\, dx$

[3](a)If $A = \begin{bmatrix} 2 & 1 & 3 \\ 1 & 0 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 3 & 1 \\ 2 & 1 & 2 \end{bmatrix}$.

Find, if possible, A.B, |A|, A + B, $A.A^t$, $A.B^t$, $|A.B^t|$.

(b) Write the linear system in matrix form and determine the type of solution:

$2x - y = 1$, $4x - 2y = 2$.

[4](a)Write the matrix of the chemical compound and find the eigenvalues:

CH_3 —— C≡≡≡ CH

(b) If a drug exists in 3 dosage forms :

First type of concentration: 1 mg / tablet

Second type of concentration: 2 mg / tablet

Third type of concentration: 4 mg / tablet

If the pharmacist wanted to produce 10 tablets containing 3 mg / tablet by mixing whole tablets. Find all possible solutions.

Good luck *Dr. Mohamed Eid*

Academic Year: 2012 – 2013 Semester: Spring Date: May, 2013 Duration Time: **2** Hours	Modern University For Technology & Information Faculty of Pharmacy	Mathematics: OCM 103 Final Exam Examiner: Dr. Mohamed Eid
Answer All Questions		Total Mark: 60

Question 1

Find **y`** where:

(a) $y = 3x^4 + 4x + 4$ (b) $y = \sin x \,.\, \ln x$ (c) $y = \frac{3}{5} - x \log x$

(d) $y = [3^x + \cos x]^8$ (e) $y = (\frac{2}{3})^x - \log x$ (f) $y = \frac{x}{\sin x}$

Question 2

Find the integrals: (a) $\int (x^4 + \frac{4}{x} + 4x)dx$ (b) $\int (2^x + \cos x)\, dx$

(c) $\int x.e^x\, dx$ (d) $\int \frac{x}{x^2 - 3x + 2} dx$ (e) $\int_0^2 (3x^2 + 2)\, dx$

Question 3

(a)If $A = \begin{bmatrix} 2 & 1 & 3 \\ 1 & 0 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 3 \\ 0 & 2 \\ 2 & 4 \end{bmatrix}$ and $C = \begin{bmatrix} 1 & -2 & -3 \\ 2 & 0 & 1 \\ 1 & -1 & -2 \end{bmatrix}$.

Find, if possible, A + B, |A|, B.C, $A + B^t$, A.C, |C|.

(b) Solve linear system: $\begin{bmatrix} 1 & -1 & 1 \\ 3 & 0 & 1 \\ 1 & -1 & 4 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 4 \\ 4 \end{bmatrix}$

Question 4

(a) Write the following linear system in matrix form and solve it:

x – y + z = 1, 3x – 2y + 2z = 2, 4x – 3y + 4z = – 2.

(b) If a drug exists in 3 dosage forms :

First type of concentration: 1 mg / tablet

Second type of concentration: 2 mg / tablet

Third type of concentration: 4 mg / tablet

If the pharmacist wanted to produce 10 tablets containing 3 mg / tablet by mixing whole tablets. Find one possible solution.

Good luck *Dr. Mohamed Eid*

Academic Year: 2013 – 2014 Semester: Autumn Date: November, 2013 Duration Time: 1 Hour	Modern University For Technology & Information Faculty of Pharmacy	Mathematics: OCM 103 Mid-Term Exam Examiner: Dr. Mohamed Eid
Answer All Questions		Total Mark: 20

[1] Find y` where:

(a) $y = 3x^3 - 2^x + 4x$ (b) $y = \frac{3}{4} + \cos x \,.\ln x$ (c) $y = (\cos x + \log x)^{-4}$

(d) $y = \frac{1}{x^3} + \frac{1}{(x+\sin x)^4}$ (e) $y = \frac{x^4}{4} + 2\cos x$ (f) $y = \ln^5 x + \ln x^5$

[2] Determine the maximum and minimum points of : $f(x) = x - e^x$

[3] Find the following integrals:

(a) $\int (x^3 + \frac{1}{x} + \cos x)\, dx$ (b) $\int (2^x + \frac{3^x}{4^x} + \cos x)\, dx$

(c) $\int \cos x \,.\sin^5 x \; dx$ (d) $\int x \cos x \, dx$

(e) $\int_0^1 (1 - x^2)^2 \, dx$

Academic Year: 2012 – 2013 Semester: Spring Date: April 2013 Duration Time: 1 Hour	Modern University For Technology & Information Faculty of Pharmacy	Mathematics: OCM 103 Mid-Term Exam Examiner: Dr. Mohamed Eid
Answer All Questions		Total Mark: 20

[1] Find y` where:

(a) $y = 3x^4 - 4\sin x$ (b) $y = 3 + 3^x.\ln x$ (c) $y = \cos x + (\log x)^8$

[2] Determine the maximum and minimum points of : $f(x) = 12x - x^3$

[3] Find the following integrals:

(a) $\int (x^3 - 4^x)\, dx$ (b) $\int (2\cos x - \sin x)\, dx$

(c) $\int (\frac{1}{x} + \sqrt{x+3})\, dx$ (d) $\int 2x(3 + x^2)^8 \, dx$

[4] Find the integral: $\int \frac{x+1}{x^2 - 5x + 6} dx$

Good luck *Dr. Mohamed Eid*