ıdemic year :second Year
gramme : math & phys.
.e: 1 /2012
al assessment mark: **60**

Department: Mathematics
No. of pages: (2)
Linear Algebra (1) first semester
Time : 3 hours

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er the following questions:

Define a subspace of a vector space and prove that the intersection of two subspaces S_1 and S_2 of a vector space (V(F),+,.) is also a subspace of V.

Show that L(S) set of span is a subspace of a vector V.

Find A^{-1} by elimination methods of a matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 5 & 3 \\ 1 & 0 & 8 \end{bmatrix}$ **(15 marks)**

) Prove that a maximal set of linearly independent $\{\underline{a}_1, \underline{a}_2, \dots\dots\dots \underline{a}_n\}$ form a basis a vector space V of dimension n.

i) Solve the following system of linear equation and find basis and dimension of ıtion

$$x+2y+3z-w=0$$

$$x-y-z+2w=0$$

$$x+5y+5z-4w=0$$

$$x+3y+7z-7w=0$$

(15 marks)

Consider the two subspaces U and W of vector space (R^4(R), +,.) where

{(1,2,2,-2), (2,3,2,-3), (1,3,4,-3)}

{(1,1,0,-1), (1,2,3,0), (2,3,3,-1)}

I (i) dim (U+W)

(ii) dim (U $\cap$W) **(15 marks)**

Math. Examination

Fayoum university — Final first term exam. 2011/2012

Faculty of science — Time allowed : 3 hours

Mathematics Dept. — Subject : Differential and integral.

Part : Second year, Branch : Chemistry and physics, Examiner : Dr. Bothaina

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Solve the following questions :

[1] Solve the inequality and express the solution in terms of intervals whenever possible :

$x(3x-1) \le 4$, $\frac{2}{2x+3} \le \frac{2}{x-5}$, $x^2 - x - 6 < 0$, $|x+3| < 0.01$.

[2](a) Find the limit :

$$\lim_{x\to 1}\frac{x^2-x}{2x^2+5x-7} \quad , \quad \lim_{x\to -2}(3x^3-2x+7) \quad , \quad \lim_{x\to\infty}\left(\frac{3x^3-x+1}{6x^3+2x^2-7}\right) \quad , \quad \lim_{x\to 0}\frac{\cos(x+\frac{\pi}{2})}{x} .$$

(b)Show that if a function f(x) is continuous at a=2 , $f(x)=\begin{cases} x^3 & \text{if } x \le 2 \\ 4-2x & \text{if } x > 2 \end{cases}$.

[3](a)Use the chain rule to find $\frac{dy}{dx}$ **and express the answer in terms of x for the function** $y=u^2$, $u=x^3-4$,

Find y'' if $\sin y + y = x$ **and find the derivative of the function** $f(x)=\frac{x}{(x^2-1)^4}$, $f(x)=\tan^2 x \sec^3 x$.

(b) If $f(x)=x^3+x^2-5x-5$ **find the intervals on which** $f(x)$ **is increasing and intervals on which** $f(x)$ **is decreasing and the local maximum and local minimum of** $f(x)$ **also find the intervals on which the graph Of** $f(x)$ **is concave upward or is concave downward and find the point of inflection , illustrate the results Graphically .**

[5](a) Evaluate : $\int (4x^2-8x+1)dx$, $\int \frac{\sec x \sin x}{\cos x}dx$, $\int \left(\frac{x^3-1}{x-1}\right)dx$, $\int_{-1}^{2}(7-3x)dx$, $\int_{0}^{3}\sqrt{9-x^2}\,dx$.

Fayoum university
Faculty of science
Mathematics Dept.

Math. Examination

Final first term exam. 2011/2012

Time allowed : 3 hours

Subject : General Math.(2) .

Part : Second year, **Branch : Geology and chemistry,** **Examiner : Dr. Bothaina**

Solve the following questions :

[1] Solve the inequality and express the solution in terms of intervals whenever possible :

(a) $x-8\rangle 5x+3$, **(b)** $-2\langle\frac{4x+1}{3}\leq 0$, **(d)** $\frac{x-2}{3x+5}\leq 4$, **(c)** $|6-5x|\leq 3$

[2] Find the first four terms of the sequence defined as $(\frac{7-4n^2}{3+2n^2})$ **and determine the sequence converges or diverges .**

[3] (a) Let the matrices A , B given by $A=\begin{pmatrix}3&1&5\\2&0&1\\1&1&7\end{pmatrix}$, $B=\begin{pmatrix}1&1&0\\2&1&-1\\3&1&5\end{pmatrix}$ **find A+B , B-A , AB .**

(b) Let x_1, x_2, x_3 **be numbers . Show that** $\begin{vmatrix}1&x_1&x_1^2\\1&x_2&x_2^2\\1&x_3&x_3^2\end{vmatrix}=(x_2-x_1)(x_3-x_1)(x_3-x_2)$.

[4] Solve the following systems of linear equations by using Cramer's Rule 2x-y+z=1 , x+3y-2z=0 , 4x-3y+z=2 .

[5] (a) Let $z=x+iy$, $z_1=r_1(\cos\theta_1+i\sin\theta_1)$, $z_2=r_2(\cos\theta_2+i\sin\theta_2)$ **prove that**

$z_1\cdot z_2=r_1r_2[\cos(\theta_1+\theta_2)+i\sin(\theta_1+\theta_2)]$ **and** $\sin^2 z+\cos^2 z=1$.

(b) Find an equation of the line that passes through the points A(2,5) and B(-2,-1) and find its slope , the distance between A and B ,and the midpoint M of segment AB .

Math. Examination

Fayoum university — Final firest term exam. 2011/2012

Faculty of science — Time allowed : 3 hours

Mathematics Dept. — Subject : Applied Math.(2) (Static).

Part : Second year, Branch : Math. And physics , Examiner : Dr. Bothaina .

Solve the following questions :

[1](a) If $\underline{r} = e^{nt}\underline{a} + e^{-nt}\underline{b}$ where a , b are constant vectors , show that $(\frac{d^2\underline{r}}{dt^2}) - n^2\underline{r} = 0$.

(b) Prove that $\underline{F} = yz\underline{i} + zx\underline{j} + xy\underline{k}$ is Solenoidal and find $curl\underline{F}$.

[2](a) Find a conservative vector field that has the given potential $f(x,y,z) = x^2 + y^2 + z^2$ and find the work

Done by the vector field for moving point from point (1,-2,1) to point (3,1,4) .

(b) If $\underline{F} = y\underline{i} - x\underline{j}$, evaluate $\oint_c \underline{F}\cdot d\underline{r}$ from (0,0) to (1,1) along the path c which is parabola $y = x^2$.

[3] Evaluate $\iint_s (y^2z^2\underline{i} + z^2x^2\underline{j} + x^2y^2\underline{k})\cdot d\underline{s}$ where s is the part of the sphere $x^2 + y^2 + z^2 = 1$,

Above the xy-plane .

[4](a) If R is a closed region in the xy-plane bounded by a simple closed curve c and if $\Phi(x,y)$ and $\Psi(x,y)$

Are continuous functions having continuous partial derivatives in R , prove that

$$\oint_c (\Psi dx + \Phi dy) = \iint_R (\frac{\partial \Phi}{\partial x} - \frac{\partial \Psi}{\partial y})dxdy .$$

(b) Find the moment of inertia of a hollow circular cylinder of radius a and mass M about axis of cylinder ,

Neglect the wall thickness.
