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Merging man and maths

**Federal Board - Supplementary 2005** Part II
Mathematics II (Objective), Time Allowed: 20 Min.
Marks: 20 , Available online @ http://www.mathcity.org/fsc

## Section – A (20 marks)

**Note:** Section A is compulsory.

**Q. 1(a): Fill in the blanks.**

i) Domain of $\cot x$ is ……..

ii) $f(x)$ has relative maxima at $x = c$ if …….

iii) $\int \frac{2x}{\sqrt{1-x^2}} dx$ = …….

iv) Equation of straight line in slope intercept form is ……

v) Equation of a parabola with vertex at origin and focus $(0,-2)$ is ……

**Q. 1(b): Encircle the correct answer as true or false.**

i) $f(x) = x^2 + 1$, $x$ is dependent variable T / F

ii) $\int \ln x \, dx = \frac{1}{x}$ T / F

iii) A point of solution where two of its boundary lines intersect is called vertex T / F

iv) $\lim_{x \to 0} \frac{\tan x}{x} = 1$ T / F

v) In an ellipse $e > 1$ T / F

**Q. 1(c): Choose and tick (✓) the best possible answer.**

i) $\sec h^2 x$ = ……..

a) $1 + \tanh^2 x$ b) $\tanh^2 x - 1$
c) $1 - \tanh^2 x$ d) None

ii) $\int e^x (\sin x + \cos x) dx$ is ……

a) $e^x \cos x$ b) $e^x \sin x$
c) $e^x \tan x$ d) None

iii) Angle between two parallel lines is ……

a) $90^\circ$ b) $270^\circ$
c) $0^\circ$ d) None

iv) A feasible region is restricted to ……..

a) $x-$axis b) $1^{st}$ Quadrant
c) $2^{nd}$ Quadrant d) None

v) If $\underline{i}$, $\underline{j}$ and $\underline{k}$ are unit vectors then: …….

a) $\underline{i} \cdot \underline{i} = 0$ b) $\underline{i} \times \underline{j} = 1$
c) $\underline{i} \cdot \underline{j} = 0$ d) None

**Q. 1(d): Match the column I with column II and write the correct answer in column III.**

| | Column I | Column II | Column III |
|---|---|---|---|
| i. | Identity Function | $e^x$ | |
| ii | $ax+by+c=0$ | Parabola | |
| iii | $c=\frac{a}{m}$ | $f(x)=x$ | |
| iv | Moment of force | Straight line | |
| v | $1+x+\frac{x^2}{2!}+\frac{x^3}{3!}+...$ | $\vec{r}\times\vec{F}$ | |

## ANSWERS

**Q . 1(a):**

(i) $\{x : x\in\mathbb{R}\wedge x\neq np, n\in\mathbb{Z}\}$ (ii) $f''(c)<0$ (iii) $-2\sqrt{1-x^2}$

(iv) $y=mx+c$ (v) $x^2=-8y$

**Q . 1(b):**

(i) F (ii) F (iii) F (iv) T (v) F

**Q . 1(c):**

(i) c (ii) b (iii) c (iv) b (v) c

**Q . 1(d):**

(i) $f(x)=x$ (ii) Straight line (iii) Parabola (iv) $\vec{r}\times\vec{F}$ (v) $e^x$

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|---|---|

## Section –B (4 ´ 10 =40 marks)

**Q # 2.** *Attempt any **TEN** parts. Graph paper will be supplied on demand.*

| | |
|---|---|
| **(i)** Evaluate: $\lim_{x\to 0}\frac{\sec x-\cos x}{x}$ | Ex 1.3 – 3(x) – p27 |
| **(ii)** Determine whether the given $f(x)=\sin x+\cos x$ is even or odd. | Ex 1.1 - Exp3(c) - p10 |
| **(iii)** If $y=a^x$, prove that $\frac{dy}{dx}=a^x\ln a$. | Ex 2.6 - Art 2.10(2) - p80 |
| **(iv)** Apply Maclaurin series to prove: $\cos x=1-\frac{x^2}{2!}+\frac{x^4}{4!}-\frac{x^6}{6!}+.....$ | Ex 2.8 – 1(ii) – p101 |
| **(v)** Evaluate: $\int \sin^{-1} x\,dx$ | Ex 3.4 – 1(xiii) – p144 |
| **(vi)** Evaluate: $\int\frac{1}{\sqrt{a^2+x^2}}dx$ | Ex 3.3 – Exp1 – p136 |
| **(vii)** Use differential to approximate the value of $(17)^{\frac{1}{4}}$ | Ex 3.1 – Exp1 – p122 |
| **(viii)** The $xy$-coordinate axes are rotated about the origin through an angle of $30^\circ$. The new axes are $OX$ and $OY$. Find the $XY$-coordinate of the point whose $xy$-coordinate are $(3,-7)$. | Ex 4.2 - 3(ii) – p190 |
| **(ix)** Use slopes, prove that following points are collinear: $(4,-5)$, $(7,5)$, $(10,15)$. | Ex 4.3 – 4(b) – p215 |
| **(x)** Indicate the solution region of the following system of linear inequalities by shading. (use graph paper) $x+y\le 5$ , $y-2x\le 2$ , $y\ge 0$. | Ex 5.1 – 3(ii) – p237 Changed |
| **(xi)** Find equation of a parabola with given elements: Focus $(-3,1)$ , Directrix: $x=3$ | Ex 6.4 – 2(i) – p281 |
| **(xii)** Find equation of the tangent to the given curve at indicated point: $x^2+5xy-4y^2+4=0$ at $y=-1$ | Ex 6.9 – 3(ii) – p324 |
| **(xiii)** Prove that the normal lines of a circle pass through the centre of the circle. | Ex 6.1 – 1 – p272 |
| **(xiv)** Use vectors to prove: $a^2=b^2+c^2-2bc\cos A$. | Ex 7.3-Exp8(i)- p348 |

## Section C ( 40 Marks (5+5 each) )

***Note:** Attempt any **FOUR** questions. Graph paper will be supplied on demand.*

| | |
|---|---|
| **Q # 3 (a)** Draw the graph: $x=t$ , $y=t^2$ , $-3\le t\le 3$ , $t$ is a parameter. | Ex 1.5 – 2(i) – p40 |
| **(b)** Find $\frac{dy}{dx}$, using 1st principle when $y=\sqrt{x+2}$. | Ex 2.1 – 2(i) – p51 |

| | |
|---|---|
| **Q # 4 (a).** If $y = x\sin^{-1}\frac{x}{a}+\sqrt{a^2-x^2}$, find $\frac{dy}{dx}$<br>**(b)** Evaluate: $\int x\sqrt{x+a}\,dx$ | Ex 2.5 – Exp1 – p78<br>Ex 3.3 – 3 – p137 Excluded |
| **Q # 5 (a)** Find two positive integer whose sum is 12 and product of one with square of the other will be maximum.<br>**(b)** Find the area between the curve $y = x(x-1)(x+1)$ and the $x-$axis. | Ex 2.10 - 3 – p117<br>Ex 3.7 – 10 – p168 |
| **Q # 6 (a)** Find joint equation of the lines through the origin and perpendicular to the lines $x^2 - 2xy\tan a - y^2 = 0$<br>**(b)** Graph the feasible region of the following system of linear inequalities and find the corner points:<br>$2x+y \le 10$ , $x+4y \le 12$ , $x+2y \le 10$ , $x \ge 0$ , $y \ge 0$ | Ex 4.5 – 7 – p228<br>Ex 5.2 – 2(i) – p243 |
| **Q # 7 (a)** If two vertices of an equilateral triangle are $A(-3,0)$ and $B(3,0)$. Find the third vertex. How many of these triangles are possible.<br>**(b)** Derive standard equation of hyperbola. | Ex 4.1 – 12 – p186<br>Ex 6.7 – Art – p291 |
| **Q # 8 (a)** Find an equation of the circle passing through the points $A(3,-1)$, $B(0,1)$ and having centre at $4x-3y-3=0$.<br>**(b)** Find a unit vector perpendicular to the plane containing $\underline{a}$ & $\underline{b}$ if $\underline{a} = 2\underline{i}-6\underline{j}-3\underline{k}$ , $\underline{b} = 4\underline{i}-3\underline{j}-\underline{k}$ | Ex 6.1 – 4(a) – p255<br>Ex 7.4 – 2(i) – p358 |
| **Q # 9 (a)** Use vectors to prove that perpendicular bisectors of the sides of a triangle are concurrent.<br>**(b)** If $f(x) = [-x+9]^3$, find $f^{-1}(x)$. Also verify $f[f^{-1}(x)] = f^{-1}[f(x)] = x$ | Ex 7.3 – 8 – p350<br>Ex 1.2 – 2(i) – p14 |