AGA KHAN UNIVERSITY EXAMINATION BOARD

HIGHER SECONDARY SCHOOL CERTIFICATE

CLASS XII EXAMINATION

MAY 2012

Mathematics Paper II

Time allowed: 2 hours 15 minutes Marks 65

INSTRUCTIONS

Please read the following instructions carefully.

1. Check your name and school information. Sign that it is correct.

I agree that this is my name and school. **Candidate's signature**

2. RUBRIC. There are SEVEN questions. Answer ALL SEVEN questions. Choices are specified inside the paper.

3. When answering the questions:

   Read each question carefully.
   Use a black pencil for diagrams. DO NOT use coloured pencils.
   DO NOT use staples, paper clips, glue, correcting fluid or ink erasers.
   Complete your answer in the allocated space only. DO NOT write outside the answer box.

4. The marks for the questions are shown in brackets ( ).

5. You may use a scientific calculator if you wish.

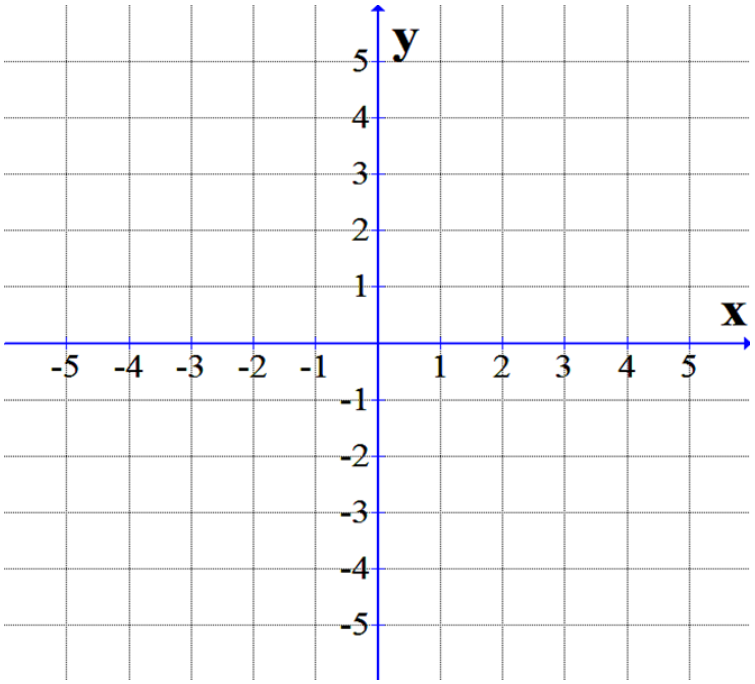
Q.1. (Total 6 Marks)

i. Complete the following table for the function $y = |-x| + 1$.

x	-2	-1	0		
y		2		3	5

(2 Marks)

ii. Draw a graph of the given function with the help of the above table. (2 Marks)



iii. Given that $g^{-1}(x) = x + 1$ and $g(f(x)) = 3x + 2$, find an expression for $f(x)$. (2 Marks)

(ATTEMPT ANY TWO PARTS FROM a, b AND c OF Q.2.)

Q.2. (Total 12 Marks)

a. Find the derivative of $\ln x$ by ab initio method or from first principle. (6 Marks)

(ATTEMPT ANY TWO PARTS FROM a, b AND c OF Q.2.)

b. Find the coordinates of the points on the curve $y = \frac{x}{x+1}$ where the tangent line is parallel to the line $y = \frac{1}{9}x - 3$. (6 Marks)

(ATTEMPT ANY TWO PARTS FROM a, b AND c OF Q.2.)

c. Show that $\frac{d}{dx}\left(\frac{1+\tan x}{\tan x}\right)$ can be written as k $\text{cosec}^2 x$. Hence, state the value of k. (6 Marks)

(ATTEMPT ANY TWO PARTS FROM a, b AND c OF Q.3.)

Q.3. (Total 14 Marks)

a. By finding the value of A and B, show that $f(x) = \frac{x^3}{x^2 - 1}$ can be written in the form of $f(x) = x + \frac{A}{(x-1)} + \frac{B}{(x+1)}$, where A and B are the integers. (7 Marks)

(ATTEMPT ANY TWO PARTS FROM a, b AND c OF Q.3.)

b. Use integration by parts to evaluate $\int \cos\sqrt{x} \quad d\,x$. (7 Marks)

(ATTEMPT ANY TWO PARTS FROM a, b AND c OF Q.3.)

c.

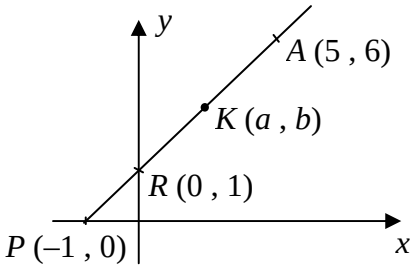
i. Determine the degree of differential equation $\left(\frac{dy}{dx}\right)^{\frac{2}{3}} = 1$. (2 Marks)

ii. A particle *A* moves in a straight line so that, *t* seconds after passing through a fixed point *P*, its velocity *v* cm/s is given by $v = t^2 - 5t + 6$. Find the distance of *A* from *P* at time *t* = 1. (5 Marks)

(ATTEMPT ANY TWO PARTS FROM a, b AND c OF Q.4.)

Q.4. (Total 10 Marks)

a. The line joining A (5 , 6) and R (0 , 1) cuts y – axis at R and meets the x – axis at P (–1 , 0). The point K (a , b) lies on AP such that $AK : AR = 3 : 5$. Find the co-ordinates of K. (5 Marks)



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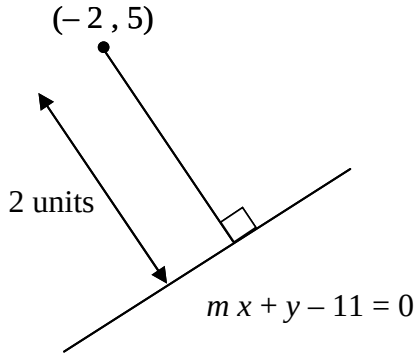
b. Find the value of m if the perpendicular distance from (– 2 , 5) to $m x + y - 11 = 0$ is 2 units. (5 Marks)



(ATTEMPT ANY TWO PARTS FROM a, b AND c OF Q.4.)

c.

i. What does the equation $x^2 + 3xy - 28y^2 = 0$ represent? (1 Mark)

ii. Find the angle between the lines represented by $2x^2 + xy - y^2 = 0$. (4 Marks)

(ATTEMPT EITHER PART a OR PART b OF Q.5.)

Q.5. (Total 7 Marks)

a. Find whether the straight line $x + y = 1$ touches the circle $x^2 + y^2 - 8x - 2y + 9 = 0$. (7 Marks)

(ATTEMPT EITHER PART a OR PART b OF Q.5.)

b.

i. Given that the radius of the circle $2x^2 + 2y^2 + 8x - 10y + m = 0$ is $\sqrt{10}$, find the value of *m*. (4 Marks)

ii. Find the length of the tangent drawn to the circle $x^2 + y^2 - 2x = 0$ from (1 , 2). (3 Marks)

(ATTEMPT ANY TWO PARTS FROM a, b AND c OF Q.6.)

Q.6. (Total 12 Marks)

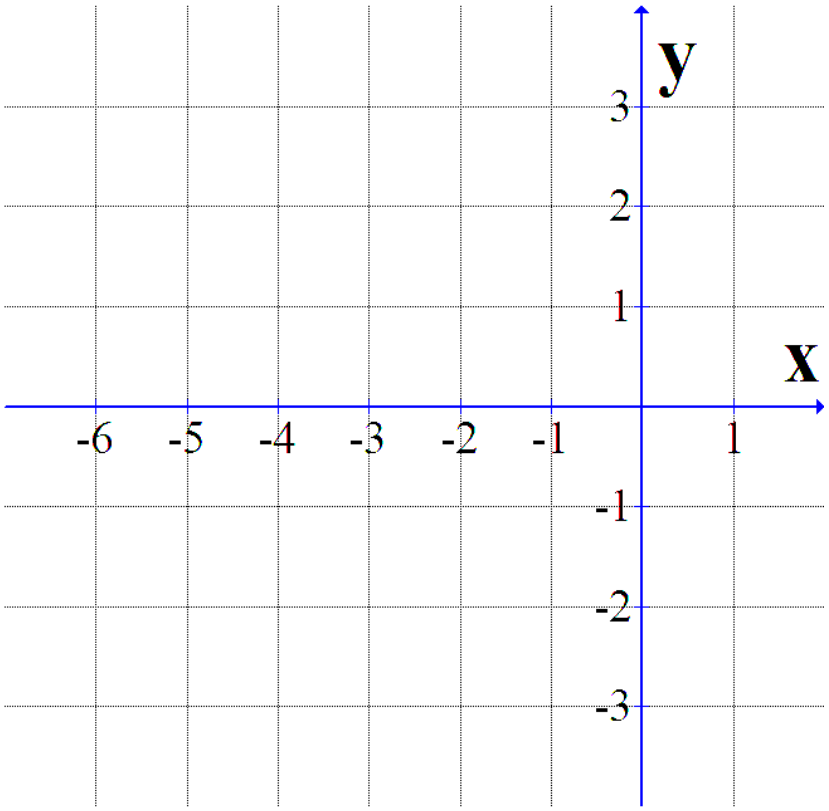
a. Derive the standard equation of parabola $y^2 = 4kx$ with the help of a diagram. (6 Marks)

(ATTEMPT ANY TWO PARTS FROM a, b AND c OF Q.6.)

b. Sketch the graph of ellipse by finding the coordinates of centre, vertices, covertices and foci.

$$\frac{(x+4)^2}{4} + \frac{y^2}{9} = 1.$$

(6 Marks)



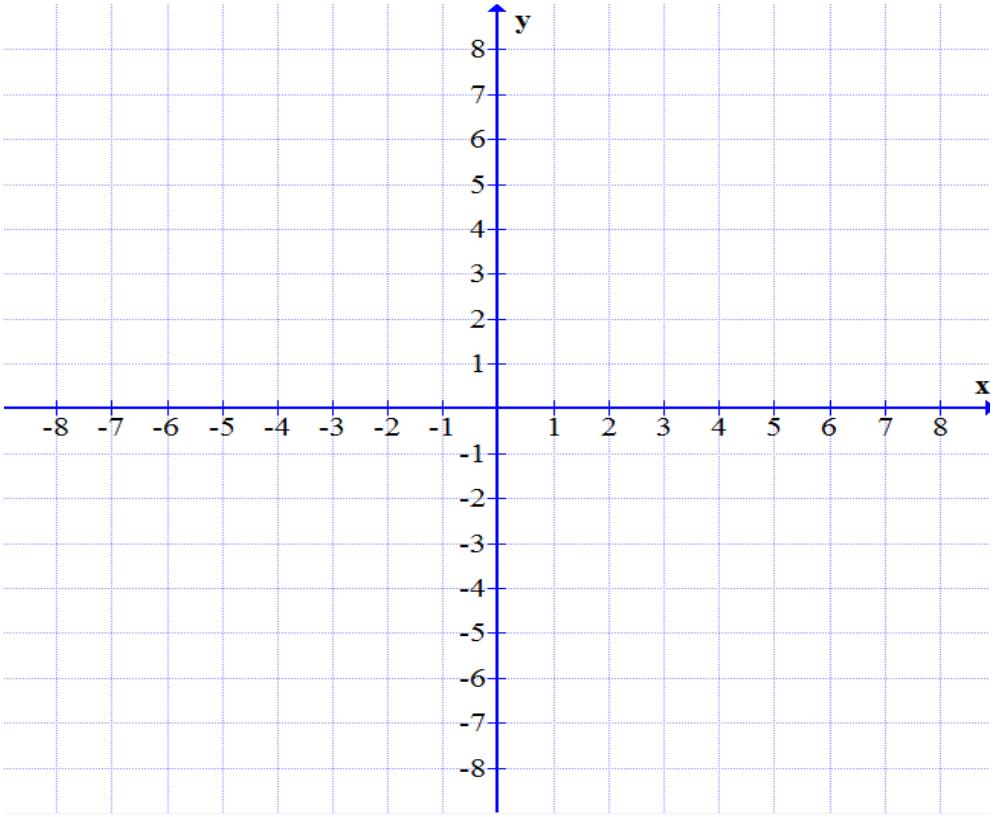
(ATTEMPT ANY TWO PARTS FROM a, b AND c OF Q.6.)

c. Find the equation of hyperbola with centre at origin having eccentricity $\frac{\sqrt{65}}{4}$ and directrices $y = \pm \frac{16}{\sqrt{65}}$. (6 Marks)

(ATTEMPT EITHER PART a OR PART b OF Q.7.)

Q.7. (Total 4 Marks)

a. Find the translated coordinates of a point *A* (2 , 0), while the origin is moved towards the point(– 2 , 0). Illustrate the situation on the graph paper given below by drawing new axes *X* and *Y*. (4 Marks)



(ATTEMPT EITHER PART a OR PART b OF Q.7.)

b. If x and y axes are rotated $45°$ about the origin, find the equation of $xy = 5$ in the new coordinate system. (4 Marks)

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