AGA KHAN UNIVERSITY EXAMINATION BOARD

HIGHER SECONDARY SCHOOL CERTIFICATE

CLASS XII EXAMINATION

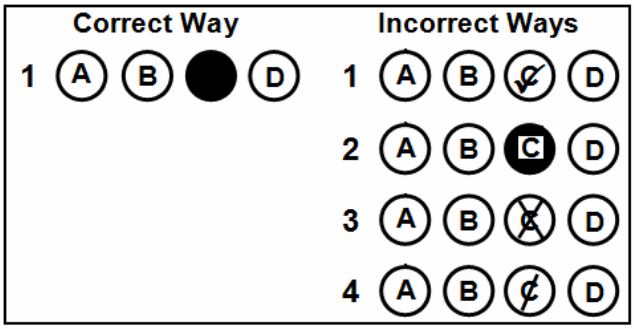
MAY 2012

Mathematics Paper I

Time allowed: 45 minutes Marks 35

INSTRUCTIONS

1. Read each question carefully.
2. Answer the questions on the separate answer sheet provided. DO NOT write your answers on the question paper.
3. There are 100 answer numbers on the answer sheet. Use answer numbers 1 to 35 only.
4. In each question there are four choices A, B, C, D. Choose ONE. On the answer grid black out the circle for your choice with a pencil as shown below.



Candidate's Signature

5. If you want to change your answer, ERASE the first answer completely with a rubber, before blacking out a new circle.
6. DO NOT write anything in the answer grid. The computer only records what is in the circles.
7. You may use a scientific calculator if you wish.

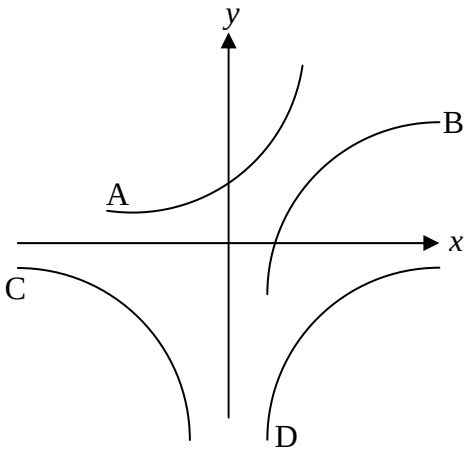
1. If $f : x \to 3 - \dfrac{4}{x+1}$; $x \neq k$, then the value of k is equal to

   A. -1
   B. 0
   C. 1
   D. 3

2. If $g(x) = x$ and $g(f(x)) = x + 1$, then $f(x)$ is equal to

   A. x
   B. $x - 1$
   C. $x + 1$
   D. $\dfrac{x+1}{x}$

3. Which of the following options represents a graph of $\ln x$?



4. $\lim\limits_{x \to 1} \dfrac{\sqrt{x} - 1}{x - 1}$ is equal to

   A. 0
   B. $\dfrac{1}{2}$
   C. $\dfrac{1}{\sqrt{2}}$
   D. ∞

5. Which of the following options is TRUE if $f(x)$ is a continuous function at $x = a$?

   I. $f(a)$ is defined
   II. $\lim\limits_{x \to a} f(x)$ exists
   III. $\lim\limits_{x \to a} f(x) = f(a)$

   A. I and II only
   B. II and III only
   C. I and III only
   D. I, II and III

6. The derivative of tan x can be written in the form of

A. $-\dfrac{\sin x}{(\cos x)^2}$

B. $\dfrac{1}{\cos^2 x}$

C. $\dfrac{\cos x}{\sin x}$

D. $\cos x \sin x$

7. If the rate of change of y is k times the rate of change of x, then $\dfrac{dy}{dx}$ is equal to

A. 0

B. 1

C. k

D. $\dfrac{1}{k}$

8. If $f(x) = 2x - 1$ and $f'(x) = ax + b$, then the values of a and b is equal to

A. 0 and 0

B. 0 and 2

C. 2 and – 1

D. – 1 and 2

9. If $\dfrac{dy}{dx} = \dfrac{1}{e^{kx}}$, then $\dfrac{d^2y}{dx^2}$ is equal to

A. $\dfrac{1}{e^{2kx}}$

B. e^{-kx}

C. ke^{-kx}

D. $-ke^{-kx}$

10. If $\dfrac{dy}{dx} = 0$, then the tangent at a point on the curve is

I. parallel to y – axis.
II. parallel to x – axis.
III. perpendicular to y – axis.

A. II and III only

B. I and III only

C. II only

D. I only

11. $1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \ldots\ldots\ldots$ is an expansion of

A. e^x
B. $\ln x$
C. $\sin x$
D. $\cos x$

12. Which of the following partial fractions is equivalent to $5x + 1 = A(x - 1) + B(x + 2)$?

A. $\frac{5x + 1}{(x - 1)(x + 2)} = \frac{A}{x - 1} + \frac{B}{x + 2}$
B. $\frac{5x + 1}{(x - 1)(x + 2)} = \frac{A}{x + 2} + \frac{Bx}{x - 1}$
C. $\frac{5x + 1}{(x - 1)(x + 2)} = \frac{A}{x - 1} + \frac{Bx}{x + 2}$
D. $\frac{5x + 1}{(x - 1)(x + 2)} = \frac{A}{x + 2} + \frac{B}{x - 1}$

13. $\int \sin(2)\, dx$ is equal to

A. $-\cos(2) + c$
B. $x \sin(2) + c$
C. $\frac{x \sin(2)}{2} + c$
D. $-\frac{\cos(2)}{2} + c$

14. If $\frac{d}{dx}\left(x\sqrt{x - 5}\right) = \frac{3x - 10}{2\sqrt{x - 5}}$, then $\int \frac{3x - 10}{2\sqrt{x - 5}}\, dx$ is equal to

A. $\frac{1}{2} x \sqrt{x - 5} + c$
B. $2x \sqrt{x - 5} + c$
C. $x \sqrt{x - 5} + c$
D. $-x \sqrt{x - 5} + c$

15. If $\int_1^k dx = 2$, then the value of k is equal to

A. -3
B. -1
C. 1
D. 3

16. $\int \frac{a}{b-x}\, dx$ is equal to

A. $-\frac{\ln(b-x)}{a} + c$

B. $\frac{\ln(b-x)}{a} + c$

C. $a\ln(b-x) + c$

D. $-a\ln(b-x) + c$

17. If $\int_2^6 f(x)\, dx = 4$ and $\int_2^9 f(x)\, dx = -7$, then the value of $\int_6^9 f(x)\, dx$ is equal to

A. -11

B. -3

C. 3

D. 11

18. If the distance between the points (0 , 0) and (0 , k) is 5 units, then the value of k is equal to

A. $\sqrt{5}$

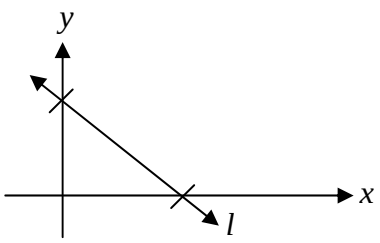
B. 2.5

C. 0

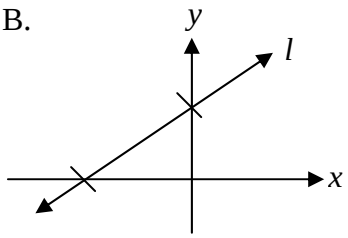
D. 5

19. Which of the following lines has a negative slope?

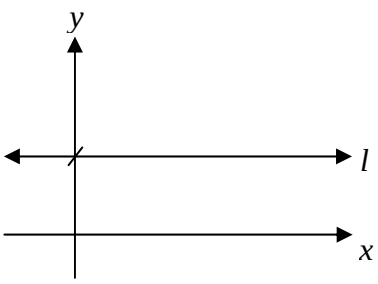
A.



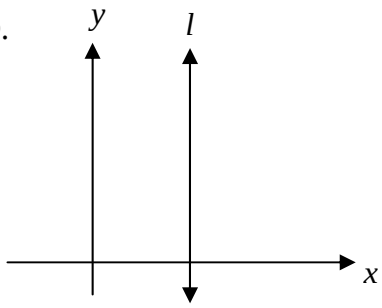
B.



C.



D.



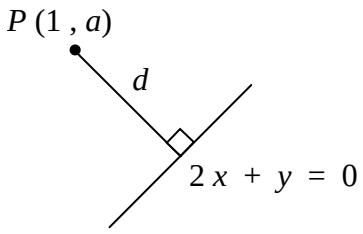
20. The perpendicular distance *d* from a point $P(1, a)$ to the line $2x + y = 0$ shown in the figure is equal to

A. $\frac{2 + a}{\sqrt{3}}$

B. $\frac{(2 + a)}{\sqrt{5}}$

C. $\frac{(1 + 2a)}{\sqrt{5}}$

D. $\frac{1 + 2a}{\sqrt{3}}$



21. Which of the following conditions is TRUE if $A(x_1, y_1)$ is a point below the line '*l* ' and $a x_1 + b y_1 + c < 0$?

A. $a > 0$
B. $a < 0$
C. $b < 0$
D. $b > 0$

22. If the angle between two lines is zero, then the lines are

I. parallel.
II. perpendicular.
III. coincident.

A. I only
B. II only
C. I and III only
D. II and III only

23. Which of the following equations represents a circle ?

A. $x^2 - y^2 = r^2$

B. $x^2 + xy + y^2 = 0$

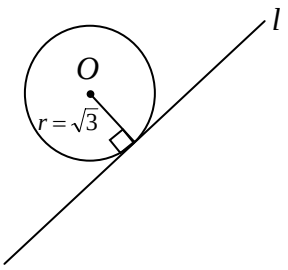
C. $(x + a)^2 + (y - b)^2 = r^2$

D. $x^2 - y^2 + 2gx + 2fy = 0$

24. If the centre of a circle is (*a* , *b*) and line *x* – axis is tangent to the circle, then the radius of the circle is equal to

A. a
B. b
C. $a^2 + b^2$
D. $\sqrt{a^2 + b^2}$

25. If the radius of the circle is $\sqrt{3}$ and the perpendicular distance between the centre and the tangent line l is $\frac{k}{\sqrt{3}}$, then the value of k is equal to

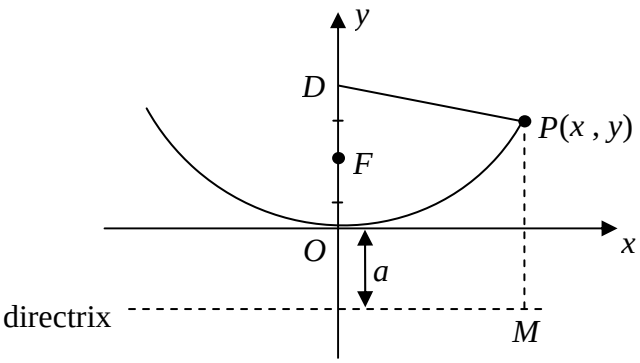


A. 3
B. 1
C. 0
D. $\sqrt{3}$

26. An equation of the form $a x^2 + b y^2 + 2 g x + 2 f y + c = 0$ represents a parabola if

A. $a = 0$, $b = 0$ and $c = 0$
B. $a = 0$ and $b = 0$
C. $g = 0$ and $f = 0$
D. $a = 0$ and $c = 0$

27. In the given figure, if F is the focus of the parabola, then the value of $|FD|$ is equal to



A. a
B. $\frac{a}{2}$
C. $\frac{a}{4}$
D. $2a$

28. Which of the following statements is TRUE for the eccentricity of an ellipse ?

A. $e^2 = 0$
B. $e^2 = \frac{1}{4}$
C. $e^2 = 1$
D. $e^2 = 4$

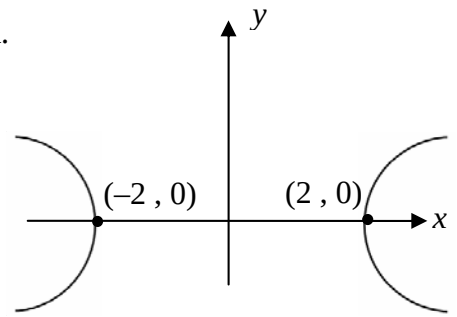
29. If the eccentricity e of an ellipse is $\frac{1}{3}$, then the value of $a : c$ is equal to

[**Note:** a and c have their usual meaning]

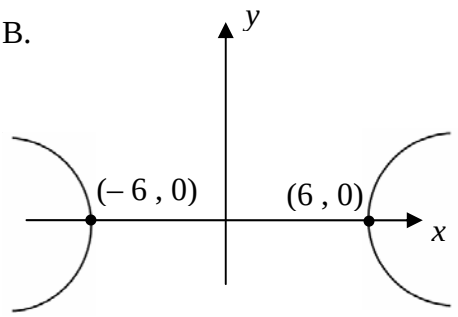
A. 1 : 2
B. 2 : 1
C. 3 : 1
D. 1 : 3

30. Which of the following graphs represents the equation of hyperbola $\frac{x^2}{4} - \frac{y^2}{36} = 1$?

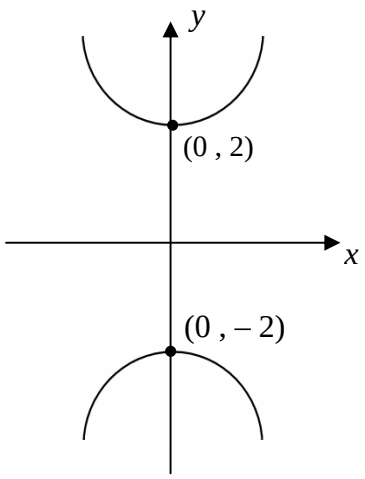
A.



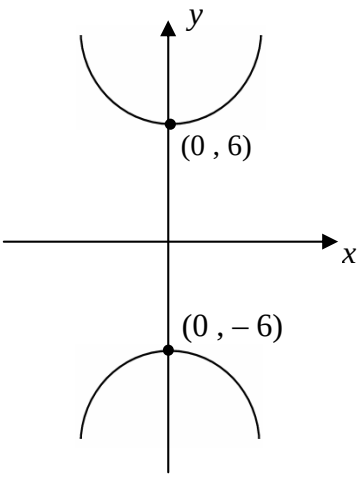
B.



C.



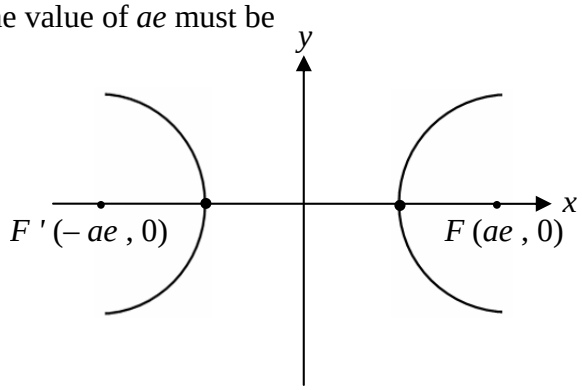
D.



31. In the given figure, if foci are $(\pm ae , 0)$, then the value of *ae* must be

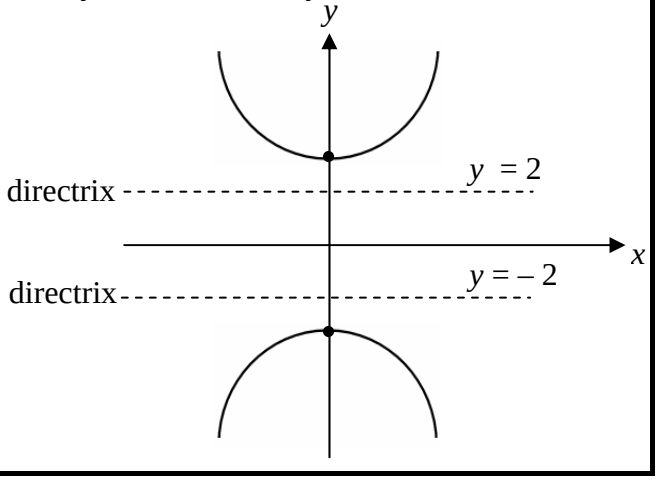
I. less than 0
II. less than 1
III. greater than 1

A. I and III only
B. II only
C. III only
D. I only



32. In the given figure, if the equations of directrices are $y = \pm 2$, then the *y* - coordinates of foci in terms of eccentricity (*e*) is equal to

A. $\pm \frac{e}{2}$
B. $\pm 2e$
C. $\pm e^2$
D. $\pm 2e^2$



33. Which of the following conditions is equivalent for the equations of transformation $x = -\frac{1}{2}\left(\sqrt{3}\,X + Y\right)$ and $y = \frac{1}{2}\left(X + \sqrt{3}\,Y\right)$ for the rotation of axis?

A. $x = X\cos 150° - Y\sin 150°$
$y = X\sin 150° - Y\cos 150°$

B. $x = X\cos 150° + Y\sin 150°$
$y = X\sin 150° + Y\cos 150°$

C. $x = X\cos 150° - Y\sin 150°$
$y = X\sin 150° + Y\cos 150°$

D. $x = X\cos 150° + Y\sin 150°$
$y = X\sin 150° - Y\cos 150°$

34. The $x\,y$ – co-ordinate axes are rotated about the origin through an angle θ. If the co-ordinates of the point with respect to new axis OX and OY are $\left(0\ ,\ -2\sin\theta + 3\cos\theta\right)$, then the values of x and y is equal to

A. – 2 and 3
B. 2 and 3
C. 3 and 2
D. 3 and – 2

35. If the first degree term X is removed from the transformed equation $X^2 - 2Xh - Y^2 + 2YK + 6X + 2Y + A = 0$, then the value of h is equal to

A. 8
B. 4
C. 3
D. – 3

END OF PAPER

Please use this page for rough work

Please use this page for rough work

Please use this page for rough work