**IIT-JEE-Mathematics-Screening-2002**

**SCREENING**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**1.** Let ω=-1/2+i √3/2 . Then the value of the determinant

       

(A) 3ω
(B) 3ω(ω-1)
(C) 3ω2
(D) 3ω(1-ω)

**2.** For all complex numbers z1,z2 satisfying |z1 |=12 and |z2-3-4i|=5, the minimum value of |z1-z2 | is:
(A) 0
(B) 2
(C) 7
(D) 17

**3.** If a1 a2,…..,an are positive real numbers whose product is a fixed number c, then the minimum value of a1+a2+…+an-1+2an is

(A)       n(2c)1/n
(B)       (n+1)c1/n
(C)       2nc1/n
(D)       (n+1)(2c)1/n

**4.**        Suppose *a, b, c* are I A.P. and *a2, b2, c2* are in G.P. If a<b<c  and  *a+b+c* =3/2, then the value of *a* is

(A)       1/2√2
(B)       1/ 2√3
(C)       ½ - 1/√3
(D)       ½ - 1/√3

**5.**        The number of arrangements of the letters of the word BANANA in which the two N' s do not appear adjacently is
(A)       40
(B)       60
(C)       80
(D)       100

**6.**         The sum

    
if p > q is maximum when m is
(A)       5
(B)       10
(C)       15
(D)       20

**7.**        The number of values of k for which the system of equations
(k+1)x + 8y=4k
kx +(k+3)y = 3k -1
has infinitely many solution is
(A)       0
(B)       1
(C)       2
(D)       Infinite
 **8.**         The set of all real numbers x for which  x2 - |x+2| + x > 0 is
(A)    (-∞, -2) υ (2, ∞)
(B)    (-∞, -√2) υ (√2, ∞)
(C)    (-∞, -1) υ (1, ∞)
(D)    (√2, ∞)

**9.**        The length of a longest interval in which the function  3sin x - 4sin3 x is increasing, is
(A)   Π/3
(B)   Π/2
(C)   3Π/3
(D)   Π

**10.**       Which of the following pieces of data does NOT uniquely determine an acute-angled triangle ABC (R being the radius of the circumcircle)?
(A)   a sin A, sin B
(B)   a, b, c
(C)   a, sin B, R
(D)   a, sin A, R

**11.**      The number of integral values of k for which the equation 7 cos x + 5 sin x = 2k + 1 has a solution is
(A)       4
(B)       8
(C)       10
(D)       12

**12.**       Let 0 < α < Π/2 be a fixed angle. If P = ( cosθ, sinθ ) and Q = ( cos(α-θ), sin(α-θ) ) then Q is obtained from P by
(A)       Clockwise rotation around origin through an angle α
(B)       Anticlockwise rotation around origin through an angle α
(C)       Reflection in the line through origin with slope tan α
(D)       Reflection in the line through origin with slope tan α/2

**13.**       Let P=(-1, 0) Q=(0, 0) R=(3, 3√3) be three points. Then the equation of the bisector of the bisector of the angle PQR is
(A) √3/2 x+y=0
(B) x+√3 y=0
(C) √3 x+y=0
(D) x+√3/2 y=0

**14.**     A straight line through the origin O meets the parallel lines 4x + 2y = 9 and
  2x + y + 6 = 0 at points P and Q respectively. Then the point O divides the segment PQ in the ratio
(A)       1:2
(B)       3:4
(C)       2:1
(D)       4:3

**15.**      If the tangent at the point  P on the circle x2 + y2 + 6x + 6y = 2 meets the straight  line  5x + 2y = 6 at a point Q on the y-axis, then the length of PQ is
(A)   4
(B)   2√5
(C)   5
(D)   3√5

**16.**       If a>2b>0 then the positive value of m for which y = mx - b√ (1 + m2 ) is a common tangent to x2+y2=b2 and (x- a)2+y2=b2  is
(A)  2b/√(a2 - 4b2)
(B)  √(a2 - 4b2)/2b
(C)  2b/(a-2b)
(D)   b/(a-2b)

**17.**       The locus of the mid-point of the line segment  joining the focus to a moving point on the parabola y2=4ax is another parabola with directrix
(A)      x = -a
(B)      x = -a/2
(C)      x = 0
(D)      x = a/2

**18.**       The area bounded by the curves y = |x| - 1 and y = - |x| + 1 is
(A)       1
(B)       2
(C)       2√2
(D)       4

**19.**      Suppose f(x) = (x + 1)2 for  x ≥ -1  If g(x) is the function whose graph is reflection of the graph of f(x) with respect to the line y = x then g(x) equals
(A)      -√x - 1, x ≥ 0
(B)       1/(x + 1)2 , x > -1
(C)       √(x + 1), x ≥ -1
(D)       √x - 1,  x ≥ 0

**20.**       Let function f : R→R be defined by f(x) = 2x + sin x for  x ε R Then f is
(A)       One-to-one and onto
(B)       One-to-one but NOT onto
(C)       Onto but NOT one-to-one
(D)       Neither one-to-one nor onto

**21.**      The domain of the derivative of the function
             
(A)    R - {0}
(B)    R - {1}
(C)    R - {-1}
(D)    R - {-1,1}

**22.**      The integer n for which   limx→0 (cosx-1)(cosx-ex) / xn is a finite non-zero number is

(A)       1
(B)       2
(C)       3
(D)       4

**23.**      Let f : R→R be such that f(1) = 3, and f'(1) = 6 Then   limx→0 ( f(1+x) / f(1) )1/x     equals

(A)       1
(B)       e1/2
(C)       e2
(D)       e3

**24.**      The point (s) on the curve y3 + 3x2 = 12y where the tangent is vertical , is (are)
(A)     ( ± 4/√3 , -2)
(B)     ( ± √11/3 , -0)
(C)      (0, 0)
(D)      ( ± 4/√3 , 2)
 **25.**       The equation of the common tangents to the curves y2 = 8x and xy = -1 is
(A)       3y = 9x+2
(B)       y = 2x + 1
(C)       2y = x +8
(D)       y = x + 2

**26.**       Let  f(x) = ∫x1 √(2 - t2)  The real roots of the equation x2 - f' (x) = 0 are
(A)    ± 1
(B)    ± 1/√2
(C)    ± 1/2
(D)    0 and 1

**27.**       Let T>0 be a fixed real number. Suppose f is a continuous function such that for all  x ε R.f(x+T)  If I = ∫T0 f(x).dx  then the value of ∫33+3T is
(A)   (3/2) I
(B)    I
(C)    3I
(D)    6I

**28.**       The integral ∫1/2-1/2 ( [x] + ln(1+x/1+x) )dx equals
(A)     -1/2
(B)       0
(C)       1
(D)       2ln(1/2)

**29.**       If vector a and bare two vectors such that  a→ + 2b→ and 5a→ - 4b→ are perpendicular to each other then the angle between vector a and b is
(A)       450
(B)       600
(C)       cos-1 1/3
(D)       cos-1 2/7

**30.**       Let  vector V = 2i→ + j→ - k→ and W→ = i→ + 3k→ . If vector U  is a unit vector, then the maximum value of the scalar triple product [U→V→W→] is
(A)       -1
(B)     √10 + √6
(C)     √59
(D)     √60