A

18721 **120 MINUTES**

1. What is the range of the real valued function $y = \frac{5}{2x-10}$?

   A) $(-\infty, \infty)$ B) $(-\infty, 0) \cup (0, \infty)$

   C) $(-\infty, 5) \cup (5, \infty)$ D) $[\,0, \infty)$

2. Which of the following is the inverse of the function $f(x) = e^{2x}$?

   A) $g(x) = \ln x$ B) $g(x) = \ln(2x)$

   C) $g(x) = \ln\sqrt{x}$ D) $g(x) = e^{-2x}$

3. If the sum of the roots of the quadratic equation $ax^2 + bx + c = 0$ equals the sum of their squares, then

   A) $2ac = ab + b^2$ B) $2ac = a + b$

   C) $2ac = a^2 + b^2$ D) $2ac = a^2 - b^2$

4. Which of the following is the equation of the plane containing the lines?

   $\frac{x-1}{-2} = y - 4 = z \; and \; \frac{x-2}{-3} = \frac{y-1}{4} = \frac{z-2}{-1}$?

   A) $x + y + z = 0$ B) $x + y + z = 1$

   C) $x + y + z = 4$ D) $x + y + z = 5$

5. The parametric equation of the line passing through the point (1, 2, 3) and perpendicular to the xz-plane is given by:

   A) $x = 1, y = 2, z = 3$ B) $x = 1 + t, y = 2, z = 3$

   C) $x = 1, y = 2 + t, z = 3$ D) $x = 1, y = 2, z = 3 + t$

6. Which of the following statements is true of the function $f(x) = \frac{x+2}{x^2-3x-10}$?

   A) f is continuous for all real x

   B) f has a removable discontinuity at $x = -2$ and a non-removable discontinuity at $x = 5$

   C) f has removable discontinuities at $x = -2$ and $x = 5$

   D) f has a removable discontinuity at $x = 5$ and a non-removable discontinuity at $x = -2$

7. Consider the functions

$$f(x) = \begin{cases} x \sin\left(\frac{1}{x}\right), x \neq 0 \\ 0, \quad x = 0 \end{cases}$$

And

$$f(x) = \begin{cases} x^2, \sin\left(\frac{1}{x}\right), x \neq 0 \\ 0, \quad x = 0 \end{cases}$$

Which of the following statements about f and g is true?

A) Both f and g are differentiable at $x = 0$

B) Both f and g are continuous at $x = 0$ and neither is differentiable at $x = 0$

C) f is continuous at $x = 0$ but not differentiable at $x = 0$, while g is differentiable at $x = 0$

D) f is differentiable at $x = 0$, while g is continuous at $x = 0$ but not differentiable at $x = 0$

8. $\int \frac{dt}{\sqrt{x}\sqrt{1+x}}$ equals:

A) $2sinh^{-1}(\sqrt{x}) + C$ B) $sinh^{-1}(\sqrt{x}) + C$

C) $\ln(\sqrt{x} + \sqrt{1+x}) + C$ D) $\ln(\sqrt{x} - \sqrt{1+x}) + C$

9. What is the volume of the solid generated by rotating the area included between the curve $y = x^2$ and the line $y = x$ about the line $x = 0$

A) $\frac{2\pi}{15}$ cubic units B) $\frac{\pi}{6}$ cubic units

C) $\frac{\pi}{3}$ cubic units D) $\frac{\pi}{2}$ cubic units

10. A card is drawn at random from a well-shuffed pack of cards. What is the probability that it is a heart card or a red card or a king?

A) $\frac{5}{13}$ B) $\frac{6}{13}$ C) $\frac{7}{13}$ D) $\frac{8}{13}$

11. An equilateral triangle is inscribed in a circle of radius 1 centimeter. If a point is taken at random within the circle, what is the probability that the point lies in the triangular region?

A) $\frac{3\sqrt{3}}{4\pi}$ B) $\frac{3}{4\pi}$ C) $\frac{\sqrt{3}}{4\pi}$ D) $\frac{3}{4}$

12. The series $\sum_{n=2}^{\infty} \frac{1}{n(logn)^p}$

A) Converges for all p

B) Diverges for all p

C) Converges if $p > 1$ and diverges if $0 < p \leq 1$

D) Converges if $p \geq 1$ and diverges if $0 < p < 1$

13. Which of the following statements is true of the function $f = \frac{1}{x^2}, x \neq 0$?

A) f is uniformly continuous on $(0, \infty)$

B) f is not uniformly continuous on $[\text{a}, \infty), \text{a} > 0$

C) f is not continuous on $[\text{a}, \infty), \text{a} > 0$

D) f is uniformly continuous on $[\text{a}, \infty), \text{a} > 0$, but not uniformly continuous on $(0, \infty)$

14. Consider the function $f(x, y) = (x^3 + y^3)^{\frac{1}{3}}$. Then

A) Both $f_x(x, y) and\ f_y(x, y)$ fail to exist on the line $y = x$

B) Both $f_x(x, y) and\ f_y(x, y)$ fail to exist on the line $y = -x$

C) Both $f_x(x, y) and\ f_y(x, y)$ fail to exist on the line $y = 0$

D) Both $f_x(x, y) and\ f_y(x, y)$ fail to exist on the line $x = 0$

15. If $u = \frac{y-x}{1+xy}$ and $v = tan^{-1}y - tan^{-1}x$, then

A) $u = \tan v$ B) $v = \tan u$ C) $u = \sin v$ D) $u = \cos v$

16. Consider the following three statements about Riemann integrability of a function f on $[a, b]$

I. If f is monotonic on $[a, b]$, then f is Riemann integrable on $[a, b]$

II. If f is bounded and continuous on $[a, b]$ except possibly at a or b, then f is Riemann integrable on $[a, b]$

III. If f is bounded and continuous on [a, b] with only a finite number of points of discontinuities in $[a, b]$, then f is Riemann integrable on $[a, b]$.

A) Statements I and II are correct B) Statements II and III are correct

C) All the three Statements are correct D) None of the three statements are correct

17. Let f be an absolutely continuous function on $[a, b]$. Choose the correct statement.

A) f is of bounded variation on $[a, b]$

B) f is not of bounded variation on $[a, b]$

C) f may or may not be bounded variation on $[a, b]$

D) None of these statements is true

18. What does the equation $|z|^2 = lm(z)$ represent in the Argand plane?

A) The imaginary axis

B) The upper half plane

C) The circle centred at $\frac{1}{2}i$ and of radius $\frac{1}{2}$

D) The unit circle centred at the origin

19. Which of the following expressions is equal to $(sin\theta + icos\theta)^4$?

A) $(cos\theta + isin\theta)^4$ B) $(cos\theta - isin\theta)^4$

C) $(sin\theta - icos\theta)^4$ D) $(sin\theta + icos\theta)^2$

20. The radius of convergence of the power series $\sum_{n=1}^{\infty} \frac{n!z^n}{n^n}$ is given by

A) $\frac{1}{e}$ B) e C) 0 D) ∞

21. The largest order of the cyclic group contained in Z_6 x Z_8 is:

A) 12 B) 18 C) 24 D) 48

22. Let Q be the Quaternion group with centre $Z(Q)$. Then the quotient group $Q/Z(Q)$ is:

A) a cyclic group of order 4 B) a Klein four-group

C) a group of order 2 D) a group of order 8

23. Let G be the group of 2x2 non-singular matrices under matrix multiplication. Let H be the subset consisting of lower triangular matrices of the form $\begin{pmatrix} a & 0 \\ c & d \end{pmatrix}$. Then

A) H is not a proper subgroup of G

B) H is not a subgroup of G

C) H is a subgroup, but not a normal subgroup of G

D) H is a normal subgroup of G

24. Let G be a group of order 15. Then the number of Sylow subgroups of G of order 3 is:

A) 0 B) 1 C) 2 D) 3

25. Let S_3 be the permutation group on three symbols with identity element e. Then the number of elements of S_3 which satisfy the equation $x^2 = e$ is:

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

26. Consider the ring $S = \left\{\begin{pmatrix} a & b \\ 0 & c \end{pmatrix} : a.b \in \mathrm{R}\right\}$ with the usual addition and multiplication of matrices and the set $T = \left\{\begin{pmatrix} a & 0 \\ 0 & 0 \end{pmatrix} : a \in \mathrm{R}\right\}$. Choose the correct statement.

A) T is a subring of S with same identity is that of S

B) T is a subring of S with an identity different from that of S

C) T is not a subring of S

D) None of these statements is true

27. The units of the Euclidean domain $Z[i]$ are:

A) ± 1 B) $\pm i$ C) $\pm 1, \pm i$ D) None of these

28. Choose the incorrect statement:

A) $[Q(\sqrt{2}, \sqrt{3}) : Q(\sqrt{2})] = 2$ B) $[Q(\sqrt{2}, \sqrt{3}) : Q(\sqrt{3})] = 3$

C) $[Q(\sqrt{2}) : Q] = 2$ D) $\sqrt{2}$ and $\sqrt{3}$ are algebraic over Q

29. Squaring the circle is impossible because:

A) $[Q(\sqrt{\pi}) : Q)]$ is a power of 2 B) $[Q(\sqrt{\pi}) : Q]$ is a power of 3

C) $[Q(\sqrt{\pi}) : Q]$ is finite D) $[Q(\sqrt{\pi}) : Q]$ is not a power of 2

30. If $A = \begin{pmatrix} 2 & 1 \\ 3 & -1 \end{pmatrix}$ and I *is* $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$, then which of the following is the zero matrix?

A) $A^2 + A - 5I$ B) $A^2 - A - 5I$

C) $A^2 + A + 5I$ D) $A^2 - A + 5I$

31. Which of the following statement is not true?

A) If A and B are symmetric matrices, then AB is symmetric

B) If A is a symmetric matrix, then A^n is symmetric, $n \in N$

C) If A is a symmetric matrix, then $f(A)$ is symmetric for any polynomial $f(x)$

D) If A is an n x n symmetric matrix and P is an n x m matrix, then $P^T AP$ is symmetric

32. Which of the following is a subspace of the vector space of n x n real matrices over R?

A) The set of n x n real symmetric matrices over R

B) The set of n x n real invertible matrices over R

C) The set of n x n real non-invertible matrices over R

D) The set of n x n real non-zero matrices over R

33. Which of the following is a basis for the vector space R^3?

I. {(1, 0, 1), (0, 1, 0), (-1, 0, 1)}

II. {(1, 2, 3), (2, 3, 4), (2, 4, 6)}

A) I only B) II only

C) Both I and II D) Neither I nor II

34. For the vector subspace W of R^3 defined by $W = \{(a, b, c) \colon c = 3a, a, b, c \in \mathrm{R}\}$

A) $\dim W = 0$ B) $\dim W = 1$ C) $\dim W = 2$ D) $\dim W = 3$

35. In which of the following cases is R^3 not a direct sum of U and V?

A) $U = \{(a, b, 0) : a, b \in \mathrm{R}\}$, $V = \{(0, b, c) \colon b, c \in \mathrm{R}\}$

B) $U = \{(a, b, 0) : a, b \in \mathrm{R}\}$, $V = \{(0, 0, c) \colon c \in \mathrm{R}\}$

C) $U = \{(a, b, c) : a = b = c, a, b, c \in \mathrm{R}\}$, $V = \{(0, b, c) \colon b, c \in \mathrm{R}\}$

D) $U = \{(a, 0, 0) : a \in \mathrm{R}\}$, $V = \{(0, b, c) \colon b, c \in \mathrm{R}\}$

36. Let $f : V \to W$ be a surjective linear map. Let $\dim V = 5$ and $\dim W = 3$. Then

A) $\dim \ker f > 2$ B) $\dim \ker f \geq 3$

C) $\dim \ker f = 2$ D) $\dim \ker f = 0, 1$ *or* 2 and each of these cases can arise

37. Consider the map $F: R^3 \rightarrow R^2$ defined by $F(x, y, z) = (x + y, y + z)$, Then

A) F is neither linear nor one to one

B) F is neither linear nor onto

C) F is linear and has zero kernel

D) F is linear and has a nonzero subspace as kernel

38. Which of the following is a solution of the differential equation $x\frac{dy}{dx} - 2y = x^3e^x$?

A) $y = x^2$

B) $y = x^2(e^x + c)$

C) $y = \sin x$

D) $y = \ln x$

39. What is the solution of the differential equation

$$\left(x \sec\left(\frac{y}{x}\right) + y\right) dx - x\, dy = 0$$

with initial condition $y(1) = 0$?

A) $x = e^{\sin\left(\frac{y}{x}\right)}$

B) $x = e^{\cos\left(\frac{y}{x}\right)}$

C) $x = e^{\sin\left(\frac{x}{y}\right)}$

D) $x = e^{\cos\left(\frac{x}{y}\right)}$

40. What is the particular integral of the partial differential equation

$$\frac{\partial^2 z}{\partial x^2} - 7\frac{\partial^2 z}{\partial x \partial y} + 3\frac{\partial^2 z}{\partial y^2} = e^{x-y}?$$

A) e^{x-y}

B) $\frac{1}{12}e^{x-y}$

C) $\frac{1}{15}e^{x-y}$

D) $\frac{1}{20}e^{x-y}$

41. Which of the following partial differential equation is hyperbolic?

A) $\frac{\partial^2 u}{\partial x^2} + 6\frac{\partial^2 u}{\partial x \partial y} + 3\frac{\partial^2 u}{\partial y^2} = 0$

B) $2\frac{\partial^2 u}{\partial x^2} + 4\frac{\partial^2 u}{\partial x \partial y} + 3\frac{\partial^2 u}{\partial y^2} = 0$

C) $4\frac{\partial^2 u}{\partial x^2} + 4\frac{\partial^2 u}{\partial x \partial y} + \frac{\partial^2 u}{\partial y^2} = 0$

D) $\frac{\partial^2 u}{\partial x^2} - 2\frac{\partial^2 u}{\partial x \partial y} + \frac{\partial^2 u}{\partial y^2} = 0$

42. Let $X = \{a, b, c\}$ and $\tau = \{X, \phi, \{a\}, \{a, b\}, \{a, c\}\}$ be a topology on X. Then

A) $(X, \tau) is\ a\ T_1\ space$

B) $(X, \tau) is\ a\ T_2\ space$

C) $(X, \tau) is$ neither a $T_1\ space$ nor a $T_2\ space$

D) $(X, \tau) is$ both $a\ T_1\ space$ and a $T_2\ space$

43. Which of the following statements is true?

A) For $1 \leq p \leq \infty$, the metric space l^p is separable

B) For $1 \leq p \leq \infty$, the metric space l^p is complete

C) For $1 \leq p \leq \infty$, the closed unit ball in l^p is compact

D) For $1 \leq p < r \leq \infty$, the normed space l^r is contained in l^p

44. Choose the correct statement from among the following:

A) The supremum norm on $C[a.b]$ comes from an inner product

B) $C[a.b]$ is not complete with respect to the supremum norm

C) $C[a.b]$ is complete with respect to $\|.\|_2$

D) $C[a.b]$ is complete with respect to the supremum norm

45. Consider two different inner products in $\mathbb{R}^2$

IP 1 defined by $< u, v >= u_1v_1 + (u_2v_1 + u_1v_2) + 2u_2v_2$

for all $u = (u_{1,}v_1)\ and\ v = (u_{2,}v_2) \in \mathbb{R}^2$ and IP 2 the standard inner product on $\mathbb{R}^2$.

Then the angle between (1, 0) and (0, 1) is:

A) $\frac{\pi}{4}$ with respect to IP 2

B) $\frac{\pi}{4}$ with respect to IP 1

C) $\frac{\pi}{2}$ with respect to both IP 1 and IP 2

D) $\frac{\pi}{4}$ with respect to both IP 1 and IP 2

46. If $y - 2x + c = 0$ is a tangent to the parabola $y^2=x$, then the value of c is

A) $-\frac{1}{8}$ B) -1 C) 2 D) -2

47. If $A=\cos(\cos x) + \sin(\cos x)$, then the least and greatest values of A are

A) 0 and 2 B) -1 and 1 C) $-\sqrt{2}$ and $\sqrt{2}$ D) 0 and $\sqrt{2}$

48. The values of $\sum_{r=1}^{18} \cos^2(5r)^\circ$, where x° denotes the x degrees, is equal to

A) 0 B) 7/2 C) 17/2 D) 25/2

49. The value of $\int_c \frac{e^{2z}}{(z-1)^5}$, where c is the circle $|z|=2$ is

A) $\frac{4\pi}{3} ie^2$ B) $\frac{8\pi}{3} ie^2$ C) $\frac{16}{3} ie^2$ D) $\frac{16}{24} ie^2$

50. Let $f:C\to C$ be defined by $f(z)=\frac{1-e^{-z}}{z}$ for $z\in\mathbb{C}$. For this function, the point $z=0$ is

A) an essential singularity B) a pole of order zero

C) a pole of order one D) a removable singularity

51. $\gamma:[0,1]\to C$ is defined by $\gamma(t)=2e^{2\pi it}$. Then $n(\gamma, \frac{1}{2})$ is

A) Not defined B) 2 C) 1 D) 0

52. The number of fixed points of the Mobius-transformation $S(z) = az + b, a \neq 0, a \neq 1$ are:

A) 2 B) 1 C) 0 D) 3

53. If $|z-3i|=|z+3i|$, the locus of z is:

A) real axis B) imaginary axis

C) circle $x^2+y^2=1$ D) parabola $y^2=9x$

54. The number of elements of order 3 in the alternating group A_4 is:

A) 7 B) 2 C) 8 D) 5

55. How many (non-isomorphic) groups of order 51 are there

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

56. Find the number of non-zero elements in the field Z_p which are squares *ie.* of the form m^2, $m \in Z_p$, $m \neq 0$, where p is an odd prime number

A) $\frac{p-1}{2}$ B) $\frac{p}{3}$ C) $\frac{p+1}{2}$ D) p

57. The number of group homomorphisms from the symmetric group S_3 to $\mathbb{Z}/6\mathbb{Z}$ is

A) 6 B) 2 C) 3 D) 1

58. Let G be a cyclic group of order 10. For $a \in G$, let $<a>$ denote the subgroup generated by a. How many elements are there in the set $\{a \in G | <a> = G\}$

A) 3 B) 4 C) 5 D) 1

59. The system $x+y+2z=a_1$, $-2x-z=a_2$, $x+3y+5z=a_3$ has no solution, then

A) $a_3=a_2$ and $a_1 \neq 0$

B) $a_3=a_2=a_1=0$

C) $a_3=3a_1$ and $a_2=0$

D) $a_2=-3a_1$ and $a_3=0$

60. The rank of the linear transformation $T: \mathbb{R}^3 \to \mathbb{R}^3$ by $T(a,b,c)=(a+2b-c, b+c, a+b-2c)$ is

A) 1 B) 2 C) 3 D) 0

61. Let A be a nilpotent linear transformation on a finite dimensional vector space V over reals. Which of the following is true about A

A) A is invertible

B) $I-A$ is invertible

C) Eigen values of A are of absolute value 1

D) A has 'n' distinct eigen values, where n is the dim of V

62. The geometrical effect of the linear transformation associated with the matrix

$$\begin{bmatrix} -1 & 0 \\ 0 & 2 \end{bmatrix}$$ is

A) rotation by an angle $\frac{\pi}{2}$

B) stretching along Y-axis and a reflection with respect to Y-axis

C) a stretching along X-axis

D) reflection with respect to X-axis

63. Let A be a 3×3 matrix with complex entries, whose eigenvalues are $1, \pm 2i$. Suppose that for some $\alpha,\beta,\gamma \in C$, $\alpha A^{-1} = A^2 + \beta A + \gamma I$, where I is 3×3 identity matrix. Then (α,β,γ) equals

A) $(-1,-4,4)$ B) $(-1,4,-2)$ C) $(-1,-2,4)$ D) $(4,-1,4)$

64. Let $M = \begin{pmatrix} 1 & a & b \\ 0 & 2 & c \\ 0 & 0 & 1 \end{pmatrix}$ where $a,b,c \in$ R, then M is diagonalizble if and only if

A) $a = bc$ B) $b = ac$ C) $c = ab$ D) $a = b = c$

65. The general solution of the wave equation $\frac{\partial^2 y}{\partial t^2} = c^2 \frac{\partial^2 y}{\partial x^2}$ is

A) $y(x,t)=\varphi(x+ct)$ B) $y(x,t)=\varphi(x+ct)+\chi(x-ct)$

C) $y(x,t)=\varphi(x-ct)$ D) No general solution exist

66. For the equation $(x^2+x-2)^2 y''+3(x+2)y'+(x-1)y=0$, which of the following is correct?

A) $x = -2$ is regular singular point; $x = 1$ is irregular singular point

B) $x = -2$ is regular singular point; $x = 1$ is regular singular point

C) $x = -2$ is irregular singular point; $x = 1$ is irregular singular point

D) $x = -2$ is irregular singular point; $x = 1$ is regular singular point

67. The partial differential equation $u_{xx}+x^2 u_{yy}=0$ is of

A) parabolic B) hyperbolic C) straight linear D) elliptic

68. The solution of $(12x+5y-9)dx+(5x+2y-4)dy=0$ is

A) $6x^2-5xy-y^2+9x-4y=c$ B) $3x^2-4xy-y^2+9x-3y=c$

C) $6x^2+5xy-y^2-9x-4y=c$ D) $6x^2+5xy+y^2-9x-4y=c$

69 Using Picard's method the approximate solution to the initial value problem $y'=1+y^2$, $y(0) = 0$ is

A) $y(x) = \tan x$ B) $y(x) = x - \frac{1}{3}x^3 - \frac{2}{15}x^5 \pm \cdots$

C) $y(x) = x - \frac{1}{3}x^2 - \frac{2}{15}x^4 \pm \cdots$ D) $y(x) = x - \frac{2}{3}x^3 - \frac{1}{15}x^5 \pm \cdots$

70. The partial differential equation formed from the equation that represents the set of all spheres whose centre lie along the z-axis is given by

A) $xp-yq=0$ B) $yp-2q=0$ C) $yp-xq=0$ D) $xp-2q=0$

71. Which of the following are solutions to the partial differential equation $\frac{\partial^2 u}{\partial x^2} = 9\frac{\partial^2 u}{\partial y^2}$

A) $\cos(3x-y)$ B) x^2+y^2 C) $\sin(3x-3y)$ D) $e^{-3\pi x}\sin\pi y$

72. Which of the following is an example of parabolic type partial differential equation

A) Wave equation B) Heat equation

C) Laplace equation D) All the above

73. Let X and Y be two topological spaces which are homomorphic. Then which of the following is not true

A) If X is connected then Y is also connected

B) If X is compact then Y is also compact

C) If X is Hausdroff then Y is also Hausdroff

D) If X is complete then Y is also complete

74. Which of the following is true?

A) The set of integers Z with usual metric is a complete metric space

B) [0, 1] is nowhere dense in R with usual topology

C) The set Q of rational numbers can be written as $Q = \cap_{n\in N} \cup_n$, where $\{U_n, n\in N\}$ is a sequence of open sets in R with usual topology

D) If d is a bounded metric in X and d' is an unbounded metric on X then d cannot equivalent to d'

75. Let X be a Hausdroff space. Then which of the following is true

A) A sequence in X may have more than one limit

B) The diagonal $\{(x,x) \mid x\in X\}$ is not closed

C) If $f:X\to Y$ is continuous and Y is Hausroff then $\{(x,y) \mid f(x)=f(y)\}$ is a closed subspace of $X\times X$

D) There exists a metric space which is not Hausdroff

76. Let τ be the topology on R genertaed by $\{ [a,a+1] \mid a\in R\}$, then

A) τ is the discrete topology B) τ is the trivial topology

C) τ is countable D) Every singleton set is open but not closed

77. Let X=R with the topology defined by U is open if and only if $X-U$ is finite or X., then the sequence $\{x_n\}$ where x_n=n for all $n \in N$

A) Converges and the limit is unique

B) The limit of x_n cannot be an integer

C) Converges to 1

D) It has no limit points

78. If $1 \leq p < q < \infty$ and $0 \neq x \in l^p$, then which of the following relation is true always

A) $||x||_p > ||x||_q$ B) $||x||_p \geq ||x||_q$ C) $||x||_p < ||x||_q$ D) $||x||_p \leq ||x||_q$

79. Let F:$X \rightarrow Y$ be a closed, linear map such that $R(F)$=Y where X and Y are Banach spaces. Which of the following is true

A) F is continuous and open B) F is continuous but not open

C) F is open and discontinuous D) F is neither continuous nor open

80. Let X be an inner product space , Y be a subspace of X and $x \in X$. Let y be a best approximation from Y to x. Then $dist(x,Y)$ is

A) $< x, y >^{1/2}$

B) $< x,\ x - y >^{1/2}$

C) $< x,\ x + y >^{1/2}$

D) $< x + y,\ x - y >^{1/2}$