CHAPTER 10.4

Systems of Nonlinear Equations

Multiple-Choice Old Exam Questions

20 questions • 4 topics • options A–E • two questions per page

Topic 1 | Systems That Lead to Quadratic Equations

Solving a linear–nonlinear or quadratic system and finding a sum, product or other combination of the solutions • Questions 1–6

Q 1

If the system $\begin{cases} 3(x-1)^2 - 2(y+1)^2 = 19 \\ (x-1)^2 - (y+1)^2 = 5 \end{cases}$ has a solution (a, b) in the first quadrant, then $a + b =$☒

A) -5

B) 1

C) 5

D) -3

E) 2

Q 2

If (m, n) and (p, q) are the solutions of the system of equations $\begin{cases} 2xy + 3 = 0 \\ x + 2y = 2 \end{cases}$, then $m + n + p + q =$☒

A) 5

B) 1

C) 3

D) 2

E) 4

Q
3

If $(a,\ b)$, $a > 0$, is the solution of the system $\begin{cases} 2x - y = 4 \\ xy = 30 \end{cases}$, then $a + b =$ ☒

A) 11

B) 9

C) 8

D) 10

E) 13

Q
4

If $(m,\ n)$ and $(p,\ q)$ are the solutions of the system $\begin{cases} x - y = 4 \\ xy = 12 \end{cases}$, then $m + n + p + q =$☒

A) 0

B) -8

C) -16

D) -10

E) -6

Q
5

If (a, b) and (c, d) are the solutions of the system $\begin{cases} x^2 - 3xy + y^2 = 4 \\ x^2 - 5xy + 6y^2 = 0 \end{cases}$, then $ac + bd =$☒

A) -12

B) -40

C) -10

D) -36

E) -20

Q
6

If one of the solutions of the system of equations $\begin{cases} 5x + y = 3 \\ y = x^2 - 3x - 5 \end{cases}$ is (A, B), where $A + B = -5$, then $AB =$☒

A) 4

B) 2

C) -7

D) 15

E) -14

Topic 2 | Circles, Ellipses and a Right Triangle

Intersections of circles, lines and ellipses, and a right-triangle word problem • Questions 7–10

Q 7

The solution set of the following system $\begin{cases}(x-2)^2+(y+3)^2=20\\(x-3)^2+(y+2)^2=10\end{cases}$ is

A) $\{(4,\,1),\,(6,\,-1)\}$

B) $\{(-4,\,1),\,(6,\,1)\}$

C) $\{(2,\,1),\,(3,\,-1)\}$

D) $\{(-2,\,1),\,(-3,\,1)\}$

E) $\{(3,\,-1),\,(5,\,-2)\}$

Q 8

The circle $x^2+y^2-2x=1$ and the line $2x+y=5$ intersect at

A) $\left(\frac{12}{5},\frac{1}{5}\right)$ and $(2,\,1)$

B) $\left(\frac{3}{5},\frac{19}{5}\right)$ and $(3,\,-1)$

C) $\left(\frac{1}{5},\frac{23}{5}\right)$ and $(4,\,-3)$

D) $\left(\frac{3}{5},\frac{19}{5}\right)$ and $(2,\,1)$

E) $\left(\frac{1}{5},\frac{23}{5}\right)$ and $(3,\,-1)$

Q
9

If $(a,\ b)$ and $(c,\ d)$ are the solutions of the system $\begin{cases} (x-1)^2+(y-2)^2=4 \\ \frac{(x-1)^2}{4}+\frac{(y-2)^2}{9}=1 \end{cases}$, then $a+b+c+d=$

A) 6

B) 10

C) 12

D) 8

E) 4

Q
10

The longest side of a right triangle is 29 cm in length. One of the other two sides is 1 cm longer than the shortest side. The sum of the lengths of the two shorter sides of the triangle is equal to

A) 41 cm

B) 31 cm

C) 51 cm

D) 43 cm

E) 53 cm

Topic 3 | Exponential, Logarithmic and Reciprocal Systems

Solving systems with exponential, logarithmic and reciprocal terms • Questions 11–14

Q **11**

If $(a,\ b)$ is a point of intersection between the curves $2^x + 2^y = 10$ and $4^x + 4^y = 68$, then $a + b =$

A) 1

B) 3

C) 2

D) 4

E) 0

Q **12**

If $(a,\ b)$ is the solution of the system $\begin{cases} y = e^x - 5 \\ y = -2e^x + 1 \end{cases}$, then $e^a =$

A) 2

B) -3

C) 4

D) 0

E) -2

Q
13

If $(a,\ b)$ is the solution of the system $\begin{cases} \frac{1}{x+2}+\frac{1}{y}=1 \\ \frac{1}{x+2}-\frac{1}{y}=-3 \end{cases}$, then $a+b=$☒

A) $\frac{19}{3}$

B) 6

C) $-\frac{5}{2}$

D) $-\frac{1}{2}$

E) $\frac{1}{5}$

Q
14

If $(x,\ y)$ is the solution of the system $\begin{cases} y=\log(x+1)+3 \\ y=\log(x+2)+2 \end{cases}$, then $27x=$ ☒

A) -24

B) 15

C) -18

D) 36

E) -4

Topic 4 | Number of Solutions of a System

Deciding how many real solutions a nonlinear system has • Questions 15–20

Q **15**

The number of the solutions of the nonlinear system $\begin{cases} 3x^2 + 2xy + y^2 = 4 \\ 4x^2 + xy + y^2 = 4 \end{cases}$ is

A) 4

B) 1

C) 3

D) 2

E) 0

Q **16**

The number of solutions of the system of nonlinear equations $\begin{cases} 2x^2 - y^2 = 4 \\ x - |y| = 0 \end{cases}$ is

A) 2

B) 3

C) 0

D) 1

E) 4

Q
17

The system of equations $\begin{cases} 2x^2 + 3y^2 = 5 \\ x^2 - 3y^2 = 4 \end{cases}$ has

A) one real solution

B) three real solutions

C) four real solutions

D) two real solutions

E) no real solutions

Q
18

The number of solutions of the system of nonlinear equations $\begin{cases} 4x^2 + 9y^2 = 36 \\ x^2 - y^2 = 25 \end{cases}$ is

A) 4

B) 3

C) 2

D) 1

E) 0

Q
19

The number of all solutions of the system $\begin{cases} \frac{4}{x^2}+\frac{6}{y^2}=\frac{7}{2} \\ \frac{3}{x^2}-\frac{6}{y^2}=0 \end{cases}$ is

A) 4

B) 3

C) 2

D) 1

E) 0

Q
20

The number of real solutions of the system $\begin{cases} x^2+xy=1 \\ xy+y^2=3 \end{cases}$ is

A) 4

B) 3

C) 0

D) 1

E) 2

Answer Key

"Original" shows the question number in the source worksheet.

Q	Original	Ans.	Value
1	1	**C**	5
2	3	**C**	3
3	4	**A**	11
4	14	**A**	0
5	15	**B**	-40
6	18	**E**	-14
7	6	**A**	$\{(4,\ 1),\ (6,\ -1)\}$
8	8	**A**	$\left(\frac{12}{5}, \frac{1}{5}\right)$ and $(2,\ 1)$
9	10	**A**	6
10	5	**A**	41 cm
11	2	**D**	4
12	7	**A**	2
13	9	**C**	$-\frac{5}{2}$
14	12	**A**	-24
15	11	**A**	4
16	13	**A**	2
17	16	**E**	no real solutions
18	17	**E**	0
19	19	**A**	4
20	20	**E**	2