CHAPTER 1.2

Graphs of Equations and Circles

Multiple-Choice Old Exam Questions

27 questions • 5 topics • options A–E • two questions per page

Topic 1 | Symmetry and Features of Graphs

Testing equations for symmetry and deciding when a graph exists • Questions 1–6

Q **1**

The graph of the equation $xy^2 = |x^4 - y^2|$ is

A) symmetric with respect to the x-axis only

B) not symmetric with respect to the x-axis, the y-axis, nor the origin

C) symmetric with respect to the x-axis and the y-axis

D) symmetric with respect to the y-axis only

E) symmetric with respect to the origin only

Q **2**

The graph of the equation $|x - y| = y^2 + 1$ is

A) symmetric with respect to the origin only

B) symmetric with respect to the x-axis only

C) symmetric with respect to the y-axis only

D) symmetric with respect to the x-axis, the y-axis and the origin

E) not symmetric with respect to the x-axis, the y-axis, nor the origin

Q
3

The graph of the equation $y^3 = -x^3y^2 + \frac{x}{|x|}$ is symmetric with respect to

A) the origin only

B) the y-axis and the origin

C) the x-axis and the origin

D) the x-axis only

E) the y-axis only

Q
4

The graph of the equation $|xy| + |x|y = 1$ is symmetric with respect to

A) both the x-axis and the y-axis

B) the x-axis only

C) the y-axis only

D) the origin only

E) both the x-axis and the origin

Q
5

The graph of the equation $|y| = (x - y)^2$ is

A) symmetric with respect to the origin only

B) symmetric with respect to the x-axis only

C) symmetric with respect to the y-axis only

D) symmetric with respect to the x-axis and the y-axis

E) not symmetric with respect to the x-axis, the y-axis, nor the origin

Q
6

Which of the following statements is FALSE about the graph of the equation $(x - 3)^2 + (y - 2)^2 = m$?

A) If $m = -9$, then the graph of the equation is nonexistent

B) If $m = 9$, then the graph of the equation is a circle that is tangent to the y-axis

C) If $m = 9$, then the graph of the equation is a circle that is tangent to the x-axis

D) If $m = 0$, then the graph of the equation is a point that is above the x-axis

E) If $m = 4$, then the graph of the equation is a circle with radius 2

Topic 2 | Center and Radius of a Circle

Completing the square to find the center and radius from the general equation • Questions 7–12

Q **7**

If the graph of the circle $2x^2 + 2y^2 - 8x + 4y = 0$ has center (h, k) and radius r, then $h + k + r^2 =$

A) 6

B) 4

C) $\sqrt{5} + 1$

D) $\sqrt{5} - 1$

E) 2

Q **8**

The center $C(h, k)$ and the radius r of the circle $\frac{1}{2}x^2 + \frac{1}{2}y^2 - 3x + 2y - \frac{3}{2} = 0$ are

A) $C(3, -2),\ r = 4$

B) $C(2, -3),\ r = 4$

C) $C(3, -2),\ r = \sqrt{15}$

D) $C(3, -2),\ r = \sqrt{17}$

E) $C\left(\frac{3}{2}, -1\right),\ r = \frac{\sqrt{2}}{2}$

Q
9

If (h, k) is the center and r is the radius of the circle $2x^2 + 2y^2 - 6x + 10y = 1$, then $h + k + r =$

A) 2

B) -1

C) 8

D) 4

E) 5

Q
10

If (h, k) is the center and r is the radius of the circle $2x^2 + 2y^2 - 8x + 20y + 26 = 0$, then $h + k + r =$

A) -3

B) 1

C) 5

D) 3

E) -7

Q
11

If the center of the circle $x^2 + y^2 + 4x - 6y = 9$ is $(2a + 1, 2b - 1)$, then the value of ab is equal to

A) -3

B) $-\frac{3}{4}$

C) $-\frac{2}{3}$

D) $-\frac{1}{3}$

E) $\frac{4}{3}$

Q
12

For the circle $3x^2 + 3y^2 + 18x + 24y + 27 = 0$, which one of the following is TRUE?

A) The center is $(3, 4)$ and the radius is 2.

B) The center is $(4, 3)$ and the radius is 4.

C) The center is $(-3, -4)$ and the radius is 4.

D) The center is $(-3, -4)$ and the radius is 16.

E) The center is $(-4, -3)$ and the radius is 4.

Topic 3 | Writing the Equation of a Circle

Finding an equation from a diameter, a center, a tangent line or a graph • Questions 13–18

Q **13**

The equation of the circle having a diameter with endpoints $(-5, 3)$ and $(1, 5)$ is

A) $x^2 + y^2 + 4x - 8y + 10 = 0$

B) $x^2 + y^2 - 4x + 8y - 10 = 0$

C) $x^2 + y^2 - 4x + 8y + 10 = 0$

D) $x^2 + y^2 + 4x - 8y - 10 = 0$

E) $x^2 + y^2 - 4x - 8y - 10 = 0$

Q **14**

If $(4, 6)$ is one endpoint of a diameter of a circle with center $\left(-3, \frac{3}{2}\right)$, then the other endpoint of the diameter is

A) $(-10, -3)$

B) $(10, 3)$

C) $(-10, 3)$

D) $\left(\frac{1}{2}, \frac{15}{4}\right)$

E) $\left(-7, -\frac{9}{2}\right)$

Q
15

An equation of the circle centered at $(-3,\ 4)$ in the graph below is

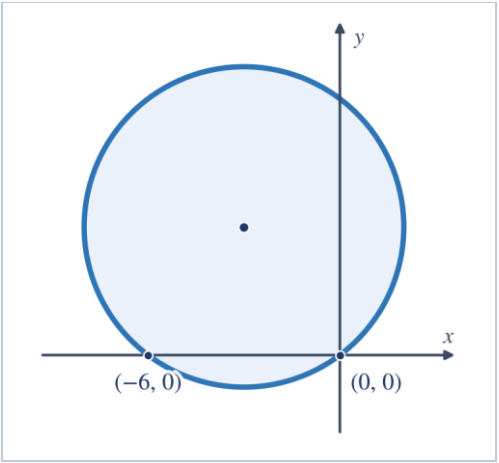
A) $x^2 + y^2 + 6x - 8y = 0$

B) $x^2 + y^2 - 6x + 8y = 0$

C) $x^2 + y^2 + 6x - 8y - 25 = 0$

D) $x^2 + y^2 - 6x + 8y - 25 = 0$

E) $x^2 + y^2 + 6x - 8y + 25 = 0$



Q
16

The equation of the circle with center $(3,\ -1)$ and tangent to the x-axis is

A) $x^2 + y^2 - 6x + 2y + 9 = 0$

B) $x^2 + y^2 - 6x + 2y = 0$

C) $x^2 + y^2 + 6x - 2y - 9 = 0$

D) $x^2 + y^2 - 6x + 2y + 1 = 0$

E) $x^2 + y^2 + 6x - 2y - 3 = 0$

Q
17

The general equation of the circle with center $C(3,\ 2)$ and tangent to the x-axis is given by

A) $x^2 - 6x + y^2 - 4y + 9 = 0$

B) $x^2 + y^2 - 6x - 4y + 4 = 0$

C) $x^2 + y^2 + 6x + 4y + 9 = 0$

D) $x^2 + y^2 - 4x - 6y + 9 = 0$

E) $x^2 + y^2 - 6x - 4y - 9 = 0$

Q
18

A circle in the second quadrant, tangent to both axes, and of diameter 1 has the equation

A) $4\left(x + \frac{1}{2}\right)^2 + 4\left(y - \frac{1}{2}\right)^2 = 1$

B) $4\left(x - \frac{1}{2}\right)^2 + 4\left(y + \frac{1}{2}\right)^2 = 1$

C) $4\left(x + \frac{1}{2}\right)^2 + 4\left(y + \frac{1}{2}\right)^2 = 1$

D) $4\left(x - \frac{1}{2}\right)^2 + 4\left(y - \frac{1}{2}\right)^2 = 1$

E) $\left(x + \frac{1}{2}\right)^2 + \left(y - \frac{1}{2}\right)^2 = 1$

Topic 4 | Circles Tangent to the Axes

Using the fact that the radius equals the distance from the center to a tangent axis • Questions 19–22

Q **19**

If the circle $(x-a)^2+(y-b)^2=4$, $a<0$, $b>0$, is tangent to both axes, then $2a+3b=$

A) 2

B) 4

C) -2

D) -4

E) 6

Q **20**

If the graph of the circle $(x+2)^2+(y-3)^2=k-1$ is tangent to the y-axis, then $k=$

A) 5

B) 3

C) 8

D) 10

E) 7

Q
21

If $x^2 + y^2 + ax + by + c = 0$ is the equation of the circle whose center is in the second quadrant, with radius 5 and tangent to both the x-axis and the y-axis, then $a + b + c =$

A) 5

B) 25

C) 20

D) 0

E) 35

Q
22

If $x^2 + y^2 + 2x + dy + 1 = 0$ is the equation of the circle that has center $(-1, a)$ in the second quadrant and is tangent to both axes, then $a + d =$

A) -1

B) 0

C) 1

D) -3

E) 3

Topic 5 | Distances, Intercepts and Conditions for a Circle

Applying the circle equation to distances, intercepts, parameters and figures • Questions 23–27

Q **23**

The distance between the point $(-4, -4)$ and the center of the circle $x^2 + y^2 - 6x + 10y + 25 = 0$ is equal to

A) $5\sqrt{2}$

B) $4\sqrt{2}$

C) $3\sqrt{2}$

D) $2\sqrt{5}$

E) $10\sqrt{5}$

Q **24**

The distance between the center of the circle $(x - 3)^2 + (y + 2)^2 = 36$ and the point $(-5, 3)$ is

A) $\sqrt{89}$

B) 89

C) 13

D) $\sqrt{39}$

E) 36

Q
25

The product of the x-intercepts of the graph of the equation $(x-1)^2 + y^2 = 2$ is

A) -1

B) 1

C) 2

D) -2

E) 0

Q
26

If $x^2 + y^2 + 2x + y - 1 = k$ represents the equation of a circle, then the value(s) of k is (are)

A) $\left(-\frac{9}{4}, \infty\right)$

B) $\left(-\infty, -\frac{9}{4}\right)$

C) $-\frac{9}{4}$

D) $(-\infty, -4)$

E) $-\frac{11}{4}$

Q
27

In the figure, the lines SQ and PR are the horizontal and vertical diameters of the circle $(x-3)^2+(y+2)^2=16$. If the point $M(a,\ b)$ is the midpoint of the line segment PQ, then $a+b=$

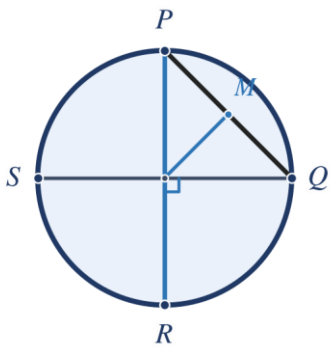
A) 5

B) 3

C) 7

D) 10

E) $4\sqrt{2}$



Answer Key

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

Q	Original	Ans.	Value
1	2	**A**	symmetric with respect to the x-axis only
2	5	**A**	symmetric with respect to the origin only
3	11	**A**	the origin only
4	18	**C**	the y-axis only
5	25	**A**	symmetric with respect to the origin only
6	17	**C**	If $m = 9$, then the graph of the equation is a circle that is tangent to the x-axis
7	3	**A**	6
8	7	**A**	$C(3, -2),\ r = 4$
9	13	**A**	2
10	20	**B**	1
11	9	**A**	-3
12	23	**C**	The center is $(-3, -4)$ and the radius is 4.
13	6	**A**	$x^2 + y^2 + 4x - 8y + 10 = 0$
14	16	**A**	$(-10, -3)$
15	26	**A**	$x^2 + y^2 + 6x - 8y = 0$
16	8	**A**	$x^2 + y^2 - 6x + 2y + 9 = 0$
17	12	**A**	$x^2 - 6x + y^2 - 4y + 9 = 0$
18	15	**A**	$4\left(x + \frac{1}{2}\right)^2 + 4\left(y - \frac{1}{2}\right)^2 = 1$
19	1	**A**	2
20	4	**A**	5
21	19	**B**	25
22	21	**A**	-1
23	10	**A**	$5\sqrt{2}$
24	14	**A**	$\sqrt{89}$
25	22	**A**	-1
26	24	**A**	$\left(-\frac{9}{4}, \infty\right)$
27	27	**A**	5