

Exercise 1.2.61 Consider $x^2 + y - 9 = 0$.

List the intercepts and test for symmetry.

Solution

To find the x -intercepts, we set $y = 0$ and consider $x^2 + (0) - 9 = 0$ or $x^2 = 9$ or $\sqrt{x^2} = \sqrt{9}$ or $|x| = 3$ or $x = \pm 3$. So the x -intercepts are $(-3, 0)$ and $(3, 0)$.

To find the y -intercepts, we set $x = 0$ and consider $(0)^2 + y - 9 = 0$ or $y = 9$. So the y -intercept is $(0, 9)$.

To test for symmetry with respect to the x -axis, we replace y with $-y$ to get $x^2 + (-y) - 9 = 0$ or $x^2 - y - 9 = 0$. This equation is not equivalent to the original equation since $(x, y) = (0, 9)$ is on $x^2 + y - 9 = 0$ but $(x, y) = (0, 9)$ is not a point on $x^2 - y - 9 = 0$ since $(0)^2 - (9) - 9 = -18 \neq 0$ (for example).

So the equation is not symmetric wRT the x -axis.

To test for symmetry with respect to the y -axis, we replace x with $-x$ to get $(-x)^2 + y - 9 = 0$ or $x^2 + y - 9 = 0$ which is the original equation. So the equation

is symmetric wRT the y -axis.

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To test for symmetry with respect to the origin, we replace x with $-x$ and replace y with $-y$ to get $(-x)^2 + (-y) - 9 = 0$ or $x^2 - y - 9 = 0$. As we saw above, this is not equivalent to the original equation and so the equation is not symmetric with respect to the origin. \square