Example 4 Graph f(x) = x^2 -2x - 8

Steps to Graph ax^2 + bx + c

- Find the vertex and the axis of symmetry. Sketch these in.
- Find the x-intercept by plugging in 0 for y.
- Find the y-intercept by plugging in 0 for x.
- Reflect your points across the axis of symmetry and connect your dots with a smooth U-shaped (not V-shaped) curve.

Graph f(x) = x^2 -2x - 8

image.png

for now, I'm just gonna type my work and figure out what to do next

1. find the line of symmetry -
    1. a = 1, b = -2, c = -8
2. use this to find the vertex
    1. x = (b/2a)
    2. x = -(-2) / 2(1) = 1
3. since we know that the along the x axis at 1 will be the vertex we replace x with 1 in the original formula
    1. x=1
    2. y = x^2 -2x - 8
    3. y = 1^2 + -2 * 1 - 8 = 1- 2 - 8 = -9
    4. y = -9
4. the vertex is (1, -9)
5. since the vertex is -1,-9 we know that x=1 is the axis of symmetry
6. finding the y-intercept is the easiest to start with because we just replace x with 0
7. x = 0 | y = x^2 -2x - 8
8. y = 0 - 8 = -8
9. y-intercept = (0,-8)
10. so so To find the x-intercepts, you can set y equal to zero and solve for x:
11. y = 0 | x = (-b ± sqrt(b^2 - 4ac)) / 2a
    1. x = (-(-2) ± sqrt((-2)^2 - 4(1)(-8))) / 2(1)
       x = (2 ± sqrt(4 + 32)) / 2
       x = (2 ± sqrt(36)) / 2

x = (2 ± 6) / 2
x = 8 / 2 or x = -4/ 2
x = 4 or x = -2
sooooo (-2,0) & (4,0)

12. so since we know 3 y axis points on the graph and the axis of symmetry we can get another point without doing much work
    1. symmetry line = x = 1,
    2. calc'd x-intercept 0,-8
        1. the symmetry line is 1 and the known point is 0 since 1-0 = 1 we can add that to the x coordinate of y and keep the same y coordinate to get the mirrored point making another point on the graph (2,-8)
    3. since we need one more point for the graph we can choose say x=3, | x^2 -2x - 8
        1. y = 3^2 -3*2 - 8 = -5
            1. soooo the new point is (3,-5) if we mirror that along 1,-9 we get (-1, -5) because 3 is 2 more than 1, and 2 less than 1 is -1. we also keep the same y coordinate
    4. so all points are:
        1. (1, -9)
        2. (0,-8)
        3. (2, -8)
        4. (3,-5)
        5. (-1,-5)

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