
These are not meant to be detailed solutions. If you can't figure out why a given answer is correct, talk to us after class or in office hours.

1. (i) B. Using the distance formula, we have

$$D = \sqrt{(-4 - 2)^2 + (6 - (-1))^2} = \sqrt{36 + 49} = \sqrt{85}.$$

(ii) A. Using the midpoint formula, we have $(\frac{-8+2}{2}, \frac{3-7}{2}) = (-3, -2)$

(iii) D. This is the point-slope form of the equation of a line with slope m through the point (x_1, y_1) .

(iv) C. The graph of every equation is a line, but only this one has a slope of $1/2$.

2. (i) The function is increasing on the intervals $(-\infty, -5)$, $(-2, 2)$, and $(5, \infty)$. It's decreasing on $(-5, -2)$ and $(2, 5)$.

(ii) You had to estimate some of the x -intercepts, but roughly speaking they are -6 , -4 , 0 , 4 , and 6 . The y -intercept is 0 .

(iii) The function has local maxima where $x = -5$ and $x = 2$. It has local minima where $x = -2$ and $x = 5$.

(iv) The function has no global maximum or minimum, because its range is the set of all real numbers; there is no function value which is bigger (or smaller) than all of the others. (Here I'm assuming that the graph continues down to the left and up to the right. If you made a different assumption, and explained it adequately, you received credit for this part of the problem.)

3. In each case, part of the definition should include the fact that "if x is in the domain, $-x$ is also in the domain." For an even function, you should also mention that $f(-x) = f(x)$, and your graph should therefore have symmetry about the y -axis.

For an odd function, $f(-x) = -f(x)$, and the graph should have symmetry about the origin.

I said in class that the bit about the domain was a “little, technical part of the definition,” and the bit about $f(-x)$ was the real heart of the matter. For that reason, the statement about the domains was only worth 1 point in each part, compared with 3 for the statement about $f(-x)$. If you didn’t specifically talk about the domain, but wrote something which basically implied it, I only took off one point total, instead of 2.

4. (i) The domain of this function is $\{x \mid x \geq 2\}$, because we need to make sure the number under the square root is greater than or equal to zero. The range of the function is $\{y \mid y \geq -3\}$.

(ii) Take the graph of \sqrt{x} , shift it horizontally two units to the right, and then shift it horizontally three units down.

5. (i) Completing the square,

$$\begin{aligned}x^2 - 4x + y^2 + 6y &= 3 \\(x^2 - 4x + (-2)^2) + (y^2 + 6y + (3)^2) &= 3 + (-2)^2 + (3)^2 \\(x - 2)^2 + (y + 3)^2 &= 3 + 4 + 9 = 16\end{aligned}$$

This is the equation of a circle centered at $(2, -3)$ with a radius of 4.

(ii) The circle is not the graph of a function, because the graph doesn’t pass the vertical line test.