

1 Graphs Involving the Distance Formula

Learn more about the geometry of $|\vec{r} - \vec{r}'|$ in two dimensions.

- (a) Make sketches of the following functions, by hand, on the same axes:

$$y = \sin x \tag{1}$$

$$y = \sin(2 + x) \tag{2}$$

Briefly describe the role that the number 2 plays in the shape of the second graph

- (b) Make a sketch of the graph

$$|\vec{r} - \vec{a}| = 2 \tag{3}$$

for each of the following values of \vec{a} :

$$\vec{a} = \vec{0} \tag{4}$$

$$\vec{a} = 2\hat{x} - 3\hat{y} \tag{5}$$

$$\vec{a} = \text{points due east and is 2 units long} \tag{6}$$

- (c) Derive a more familiar equation equivalent to

$$|\vec{r} - \vec{a}| = 2 \tag{7}$$

for arbitrary \vec{a} , by expanding \vec{r} and \vec{a} in rectangular coordinates. Simplify as much as possible. (Ok, ok, I know this is a terribly worded question. What do I mean by “more familiar”? What do I mean by “simplify as much as possible”? Why am I making you read my mind? Try it anyway. Real life is not full of carefully worded problems. Bonus points to anyone who can figure out a better way of wording the question that doesn’t give the point away.)

- (d) Write a brief description of the geometric meaning of the equation

$$|\vec{r} - \vec{a}| = 2 \tag{8}$$