Lesson 61.

NOTE 1: Be sure to read Homework Format and Homework Writing Policy BEFORE writing up your solutions to be turned in.

NOTE 2: When two or more Lessons are to be turned in on the same day, please staple the Lessons separately and turn them in separately.

Due Monday, Nov 24:

Last modified Nov 22, 2014 6:43 AM

Chapter 1 Algebra

Define the function $f$ on the interval $(-3, 2]$ by $f(x) = x^2$ for $-3 < x < 2$, $f(2) = 66$. Answer the following questions. (Sorry about the strange numbering of the problems; for my convenience, the numbering is continued from Lesson 60, but this is a separate Lesson).

4. a. Is $0 \in \text{dom}(f)$? If so, what is $f(0)$?
b. Is $-3 \in \text{dom}(f)$? If so, what is $f(-3)$? If not, what is $f(-3)$?
c. Is $2 \in \text{dom}(f)$? If so, what is $f(2)$? If not, what is $f(2)$?

5. a. Is $0$ an element of the interval $(4, 9)$? [This refers to the interval $(4, 9)$, not the ordered pair.]
b. Is $0 \in (4, 9) \cup \{66\}$?
c. Is $0 \in \{(4, 9), 66\}$?
d. Is $0 \in \{(0, 9), 66\}$?

6. Students are asked for the image of the function $f$ defined above. Here are some of the answers given:
   i. $\text{Im}(f) = (4, 9)$.
   ii. $\text{Im}(f) = (4, 9) \cup \{66\}$.
   iii. $\text{Im}(f) = \{(4, 9), 66\}$.
   iv. $\text{Im}(f) = \{(0, 9), 66\}$.
   Answer the following:
   a. Based on Problems 4(a) and 5, explain why none of these sets can be the image (or, if you think that one of them could be, explain that).
   b. Based on Problem 4(c), explain why the set in 6(i) above can't be the image.

7. In this problem, we will be considering DIFFERENT functions from that given above. Suppose $f$ is a function from $\mathbb{R}$ (the set of all real numbers) to $\mathbb{R}$.
   1. Explain why the function defined above, just before Problem 4, is NOT such a function.
   2. Determine which of the sets in Problem 6 could be the image of such a function. As usual, explain and be specific, with simple and specific examples if relevant. Proof not necessary.

NOTE: As stated on the Course Home Page, all due dates are tentative. Assignments, or parts of assignments, may be postponed to a later date.

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