MTH 225 Weekly Practice 6 Due: 11:59pm ET Sunday, October 18, 2020

Directions:

- Complete the exercises below and either write up or type up your solutions. Solutions must be submitted as PDF or Word documents, uploaded to the appropriate assignment area on Blackboard.
- If you choose to submit handwritten work, it must be neat and legible; if you do your handwritten work on paper, it must be **scanned to a PDF file** and submitted to Blackboard. Instructions and practice for scanning work to PDFs is given in the Startup Assignment. **Do not just take a picture, and do not submit a graphics file (JPG, PNG, etc.)** — such submissions will not be graded.
- Work that would receive a grade of "M" on the EMRN rubric will be given 10 engagement credits, and work that would ordinarily receive a grade of "R" will be given 5 engagement credits. No revisions will be allowed, but a key will be posted after the deadline passes.
- Every item must have a good-faith effort at a complete and correct response. If any item is left blank, or shows minimal effort (such as answering "I don't know"), or is significantly incomplete, the entire assignment will be graded at 0 engagement credits.

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1. Let $S = \{0, 1, 2, 3, 4, 5\}$ and consider the following functions from S to S. In each case, do the following:
   - Write the function in two-line notation;
   - State the range of the function (not the codomain, because the codomain of all of these is S); and
   - State whether the function is injective, surjective, or bijective.

   (a) $f(x) = 5 - x$
   (b) $g(x) = (x + 1) \ \% \ 3$
   (c) $h(x) = \text{maximum}(x, 3)$
   (d) $j(x) = \lfloor \sqrt{x} \rfloor$
   (e) $k(x) = x \ \% \ 4$
   (f) $n(x) = x^2 \ \% \ 6$

2. For each of the following sets A and B, do the following:
   - Give an example of an injective function $A \to B$ that is not surjective.
   - Give an example of a surjective function $A \to B$ that is not injective.
   - Give an example of a function $A \to B$ that is neither injective nor surjective.

   Your examples can be phrased as formulas, diagrams, or two-line notation; but they must actually have the characteristics required, and you'll need to clearly explain why your examples meet the requirements. If it's not possible to construct a particular example, say so and clearly explain your reasoning.

   (a) $A = \{1, 2, 3, 4, 5\}, B = \{a, b, c, d, e\}$.
   (b) $A = \mathbb{N}, B = \{1, 2, 3, 4, 5\}$.
   (c) $A = \mathbb{Z}, B = \mathbb{R}$.