MTH 225: Discrete Structures 1  Asynchronous lesson activities: Module 4B

**Directions**: For each item below, give a complete response that represents a good-faith effort to be right. You will receive a "check" if each item has such a response, and an "x" otherwise. An "x" will be given if *any* item is left blank, shows insufficient effort, or has responses such as “I don’t know” or “I don’t understand”. Except for the final item (which is done by filling out a Google Form), do all work on separate pages, and submit a scanned black/white PDF **by email** to talbertr@gvsu.edu.

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1. For each of the following, indicate whether it is a *proposition*, or a *predicate* with one or more free variables. If it is a proposition, state its truth value. If it is a predicate, identify the free variables. For statements involving numbers, assume the domain is the entire set of real numbers.

   (a) $\forall x(x < x + 1)$

   (b) $(a - b)(a + b) = a^2 - b^2$

   (c) $\forall b((a - b)(a + b) = a^2 - b^2)$

   (d) $\exists y(|xy| < |x|)$

   (e) $\exists y(|y| < |2y|)$

   (f) $\forall x \exists y(|xy| < |x|)$

2. Write the negation of each of the following statements. Do not just put “It is not the case that...” or a $\neg$ symbol in front of the statement.

   (a) $\forall x(x < x + 1)$

   (b) $\exists y(|y| < |2y|)$

   (c) Every cloud has a silver lining.

   (d) $\forall x \exists y(|xy| < |x|)$

3. If you have questions about the content, please list them. (Otherwise this is optional.)