

# Math 1303 - Math in the Liberal Arts

## Exam 1

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**Assigned:** 2020.09.09, 12:01 AM

**Due:** 2020.09.09 at 11:59 PM

**Instructions:** Work on this by yourself, if you feel you need to ask a question for clarification purposes, you may email the instructor. For each problem be sure to show all of your work and write every step down in a clear and concise manner. When finished, upload this front sheet and all of your work, as a pdf or jpg to Blackboard.

**Agreement:** Please read the following statement and then write it at the bottom of the page before the signature line:

*"I hereby swear that all the work that appears on this exam is completely my own, and I have not discussed any portion of this exam with any one else besides the instructor."*

**Printed Name:** \_\_\_\_\_

**Signature:** \_\_\_\_\_

**Date:** \_\_\_\_\_

1. Construct truth tables for the following statements:

- (a)  $[(p \rightarrow q) \wedge (p \rightarrow r)] \leftrightarrow [p \rightarrow (q \wedge r)]$
- (b)  $(p \vee q \vee r) \leftrightarrow [(\sim p \wedge \sim q) \rightarrow r]$

For problems 2–5, let  $p$ ,  $q$ ,  $r$ , and  $s$  be the following sentences:

$p$ : There is no open water on the planet Arrakis.

$q$ : Arrakis is a desert planet.

$r$ : Sandworms live in the desert.

$s$ : Arrakis is the only planet on which sandworms thrive.

2. Use  $p$ ,  $q$ ,  $r$ , and  $s$  as above to write each of the following symbolic statements in words.

- (a)  $q \rightarrow p$
- (b)  $r \wedge s$
- (c)  $(r \wedge s) \rightarrow q$
- (d)  $s \leftrightarrow (p \wedge q)$

3. State the negation of the following sentence without using a conditional sentence form:

*If spice melange can be found in the desert, then sandworms also live in the desert.*

4. State the negation of the following sentence without using a conjunction:

*Walk across the desert in an irregular pattern and conserve your water carefully.*

5. Consider the following argument:

If Arrakis is a desert planet, then Arrakis is the only planet on which sandworms thrive. If there is no open water on Arrakis, then sandworms live in the desert. Arrakis is a desert planet or sandworms do not live in the desert. Therefore, Arrakis is the only planet on which sandworms thrive or there is some open water on Arrakis.

- (a) Translate the above argument into symbolic form using the definition of  $p$ ,  $q$ ,  $r$ , and  $s$  as defined previously.
- (b) Determine if the argument is valid or a fallacy.

6. Use a Venn diagram to determine if the following syllogism is valid or is a fallacy.

*Some people live in the desert of Arrakis.*

*Some people who live on Arrakis are Fremen.*

*All Fremen live in the desert.*

*Some people who live on Arrakis can ride sandworms.*

*All Fremen can ride sandworms.*

*∴ Only those who live in the desert can ride sandworms.*