

CLOSED BOOK. Show all answers and work on this paper. Show all the work necessary to solve the problem. (That could be zero work.)

(1) (Each 3 points) Answer yes, no, or maybe. No explanation is needed.

(a) 0 is an integer. _____

(b) 0 is positive. _____

(c) 0 is negative. _____

(2) (Each 5 points) Which is the axiom and which is the proposition? Underline the axiom.

(a) There is $0 \in \mathbb{Z}$ such that $0 + m = m$.

or

There is $0 \in \mathbb{Z}$ such that $m + 0 = m$.

(b) $p(q + r) = qp + rp$

or

$(q + r)p = qp + rp$

or

$p(q + r) = pq + pr$

(3) (5 points) Define $x - y$.

(4) (6 points) Rewrite $(x - y)p - (q + z)$ in terms of the basic operations $+$, \cdot , and negation.