

MATH 290 – 10 JUNE 2009 – EXAM 1

Answer all of the following questions on the answer sheets provided. Show all work, as partial credit may be given.

1. (8 pts.) The following statement is taken from IRS Form 1040: *If a child didn't live with you, you earned less than \$9,000, and you or your spouse were at least age 25, you may be able to take the Earned Income Credit.*

Put the statement given above into propositional form, where we assume P = “your child lived with you”, Q = “you earned less than \$9,000”, R = “you were at least age 25”, S = “your spouse was at least age 25”, and T = “you may be able to take the Earned Income Credit.”

2. (8 pts. each) Construct a truth table for each of the following statements.

(a) $(P \Leftrightarrow Q) \Leftrightarrow (\sim P \Leftrightarrow \sim Q)$

(b) $(P \Rightarrow Q) \Leftrightarrow (\sim P \vee Q)$

3. (6 pts. each) Provide a useful negation (in English) for each of the following statements.

(a) For every real number x , $x^2 + 2x + 1 \neq 0$.

(b) For all real numbers x and y , either x and y have the same sign, or $|x + y| < |x| + |y|$.

(c) There exists $A > 0$ such that for all $x \in [a, b]$, $f(x) \geq A$.

4. (8 pts.) Let a , b , and c be integers. Prove that if a divides b , and a divides c , then a divides $b - c$.