**Test**

1. Build a digital circuit that produces the output *(p* ∨￢*r)* ∧ *(*￢*p* ∨ *(q* ∨￢*r))* when given input bits *p*, *q*, and *r*.

2. Determine the truth value of each of these statements if the domain consists of all real numbers.

**a)** ∃*x (x*3 = −1*)* **b)** ∃*x (x*4 *< x*2*)* **c)** ∀*x ((*−*x)*2 = *x*2*)* **d)** ∀*x(*2*x > x)*

3. Let *P(x)* be the statement “*x* spends more than five hours every weekday in class,” where the domain for *x* consists of all students. Express each of these quantifications in English.

**a)** ∃*xP(x)* **b)** ∀*xP(x)* **c)** ∃*x* ￢*P(x)* **d)** ∀*x* ￢*P(x)*

4. Express the statements “Some student in this class has visited Mexico” and “Every student in this class has visited either Canada or Mexico” using predicates and quantifiers.

+1x5. Find a counterexample, if possible, to these universally quantified statements, where the domain for all variables consists of all real numbers.

**a)** ∀*x(x*2= *x)* **b)** ∀*x(x*2= 2*)* **c)** ∀*x(*|*x*| *>* 0*)*