Assignment #13. Due Thurs 5/5.

1. Suppose G is a one-place predicate, M is a two-place predicate, f is a one-place function, and h is a two-place function. Which of the following are *wff*s of $\mathbf{QL}^f$? For those that are *wff*s, identify what type of *wff* it is.

(a) f(x)
(b) Gf(x) = m
(c) Mh(f(x), y)f(h(m, y))
(d) (Gh(x, f(n)) ⊃ ∀x∃z((Mxy ∧ Gf(z)) ≡ f(x)))

2. Use the translation key below to translate the following claims in English into $\mathbf{QL}^f$.

Domain: {integers}

m ⇒ 2	h ⇒ 2-place *sum* function
F ⇒ __is even	f ⇒ 1-place *successor* function
G ⇒ __is odd	
P ⇒ __is prime	
L ⇒ __is less than__	

(a) No prime number larger than 2 is even.
(b) The sum of two even numbers is always even.
(c) Every even number greater than 2 is the sum of two prime numbers.

3. Let *q* be a *q*-valuation for the vocabulary *V* = {m, F, G, P, L, h, f} of symbols that appear in the translation key in #2. Let the domain of *q* be *D* = {integers}. Let *q* assign m to 2, and let *q* assign to each predicate letter and each function letter, their intended extension in *D* (so, for example, *q* maps F to {2, 4, 6, ...}, and it maps h to {⟨0, 0, 0⟩, ⟨0, 1, 1⟩, ⟨0, 2, 2⟩, ... , ⟨1, 0, 1⟩, ⟨1, 1, 2⟩, ⟨1, 2, 3⟩, ...}). Determine the truth values in *q* of the following *wff*s that have *V* as their vocabulary. Explain your answer by refering to the appropriate semantic rules of $\mathbf{QL}^f$.

(a) Gf(m) ("The successor of 2 is odd.")
(b) ∃zGf(z) ("There are integers whose successors are odd.")
(c) ∀z(Gz ⊃ f(z) = m) ("Every odd integer has 2 as its successor.")