

Name: _____

Exam 1– MATH 313

Directions: Make sure to show any necessary work to receive full credit. If you need extra space please use the back of the sheet with appropriate labeling.

1. Use the space below to create a world where all of the following statements are true.

- (a) $\text{Dodec}(a) \wedge \text{Cube}(b)$
- (b) $\text{FrontOf}(b, a) \wedge \text{LeftOf}(d, b) \wedge \text{BackOf}(f, d) \wedge \text{RightOf}(a, f)$
- (c) $\text{Tet}(c) \wedge \text{Tet}(e) \wedge \text{LeftOf}(c, d)$
- (d) $\neg \text{LeftOf}(c, e) \wedge \neg \text{LeftOf}(e, c)$
- (e) $\text{Between}(d, b, c) \wedge \neg \text{Between}(d, c, a)$
- (f) $\neg \text{Cube}(b) \vee (\text{Cube}(d) \wedge \text{BackOf}(d, b))$
- (g) $(\text{Small}(c) \wedge \text{FrontOf}(c, b)) \vee \text{Cube}(d)$
- (h) $\text{Larger}(f, a) \wedge \text{Larger}(a, b)$
- (i) $\neg(\text{Smaller}(c, a) \vee \text{Smaller}(a, c))$
- (j) $\text{Larger}(d, b) \wedge \text{Larger}(f, d) \wedge \neg(\text{Larger}(e, d) \vee \text{Larger}(d, e))$

8. Consider the following values for sentences in the language of Tarski's World:

- 1: P is a tautology.
- 2: P is a logical necessity.
- 3: P is a logical possibility.
- 4: P is TT-possibility.
- 5: P is not a truth table possibility.

For each of the following TW-sentences determine the least value for which the sentence makes the value true. Circle each of your responses.

- (a) $\text{Cube}(a) \vee \text{Dodec}(a) \vee \text{Tet}(a)$.
- (b) $\text{Large}(a) \wedge \text{Large}(b) \wedge \text{Adjoins}(a, b)$.
- (c) $a = b$.
- (d) $\text{SameSize}(a, b) \wedge \text{SameShape}(b, a) \wedge a = b$.
- (e) $\text{Dodec}(a) \vee \neg \text{Dodec}(b)$.
- (f) $\text{Small}(a) \wedge \neg(\text{Small}(a) \vee \text{Tet}(a))$

9. Prove that the following two sentences are tautologically equivalent.

$$P \wedge (Q \vee R) \quad \text{and} \quad (P \wedge Q) \vee (P \wedge R)$$

<u>P</u>	<u>Q</u>	<u>R</u>	
T	T	T	
T	T	F	
T	F	T	
T	F	F	
F	T	T	
F	T	F	
F	F	T	
F	F	F	