Name: _____

Exam 2 – MATH 3130 – Fall 2009

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

1. Supply a Fitch proof for the following argument without premises. You may not use **Ana Con**. You may use **Taut Con** but only to establish a Law of Excluded Middle.

   1. _____

   2.

   3.

   4.

   5.

   6.

   7.

   8.

   9.

   10.

   11.

   12.

   13.

   14.

   15.

   16.

   17.

   18.

   19.

   20.

   21.

   22. $(\neg \mathbf{P} \vee \neg \mathbf{Q}) \leftrightarrow \neg(\mathbf{P} \wedge \mathbf{Q})$

2. Supply a Fitch proof for the following argument. You may not use **Ana Con**. You may use **Taut Con** but only to establish a Law of Excluded Middle.

1. $\underline{\neg \mathbf{S} \vee \mathbf{T}}$

2.

3.

4.

5.

6.

7.

8.

9.

10.

11.

12. $\mathbf{S} \rightarrow \mathbf{T}$

3. The following problem presents a formal argument. Determine if the argument is valid. If the argument is valid, supply a Fitch proof in the space provided. If the argument is not valid, supply a counterexample world using Tarski's World. You may not use **Ana Con**. You may use **Taut Con** but only to justify an instance of the Law of Excluded Middle.

1. **Dodec**(b) ∨ **Cube**(b)
2. **Small**(b) ∨ **Medium**(b)
3. ¬**Small**(b) ∧ ¬**Cube**(b)
4.
5.
6.
7.
8.
9.
10.
11.
12.
13.
14.
15.
16.
17.
18.
19.
20.
21.
22.
23.
24.
25.
26. **Medium**(b)∧ **Dodec**(b)

4. The following problem presents a formal argument. Determine if the argument is valid. If the argument is valid, supply a Fitch proof in the space provided. If the argument is not valid, supply a counterexample world using Tarski's World. You may use **Ana Con** but cite exactly two atomic sentences in support of an introduction of $\bot$. You may use **Taut Con** but only to justify an instance of the Law of Excluded Middle.

1. **Dodec**(b) $\vee$ **Cube**(b)
2. **Small**(b) $\vee$ **Medium**(b)
3. $\neg$(**Small**(b) $\wedge$ **Cube**(b))

4.
5.
6.
7.
8.
9.
10.
11.
12.
13.
14.
15.
16.
17.
18.
19.
20.
21. **Medium**(b) $\wedge$ **Dodec**(b)

5. The following problem presents a formal argument. Determine if the argument is valid. If the argument is valid, supply a Fitch proof in the space provided. If the argument is not valid, supply a counterexample world using Tarski's World. You may use **Ana Con** but cite exactly two atomic sentences in support of an introduction of $\bot$. You may use **Taut Con** but only to justify an instance of the Law of Excluded Middle.

1. **Cube**(a) $\vee$ (**Cube**(b) $\rightarrow$ **Tet**(c))
2. **Tet**(c) $\rightarrow$ **Small**(c)
3. (**Cube**(b) $\rightarrow$ **Small**(c)) $\rightarrow$ **Small**(b)

4.
5.
6.
7.
8.
9.
10.
11.
12.
13.
14.
15.
16.
17.
18.
19.
20.
21.
22.
23.
24.
25.
26.
27.
28. $\neg$ **Cube**(a) $\rightarrow$ **Small**(b)

6. The following problem presents a formal argument. Determine if the argument is valid. If the argument is valid, supply a Fitch proof in the space provided. If the argument is not valid, supply a counterexample world using Tarski's World. You may use **Ana Con** but cite exactly two atomic sentences in support of an introduction of $\bot$. You may use **Taut Con** but only to justify an instance of the Law of Excluded Middle.

1. **Cube**(b) $\leftrightarrow$ (**Cube**(a) $\leftrightarrow$ **Cube**(c))

2. **Dodec**(b)

4.

5.

6.

7.

8.

9.

10.

11.

12.

13.

14.

15.

16.

17.

18.

19.

20.

21.

22.

23.

24.

25. **Cube**(a) $\rightarrow \neg$ **Cube**(c)