Name: _____

Exam 2 – MATH 313 – Fall 2006

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

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   14. $(\neg\, \mathbf{P}) \vee (\neg \mathbf{Q})$

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. **P**→ **Q**

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12. ¬ **Q**→ ¬**P**

3. 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. **P**→ **Q**

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12. ¬ **P** ∨ **Q**

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**(e)
2. $\neg$**Small**(e)
3. $\neg$**Dodec**(e) $\vee$ **Dodec**(f) $\vee$ **Small**(e)
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21. **Dodec**(f)

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. **Dodec**(b) $\vee$ **Cube**(b)
2. **Small**(b) $\vee$ **Medium**(b)
3. $\neg$**Small**(b) $\wedge$ $\neg$**Cube**(b)
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21. **Medium**(b) $\wedge$ **Dodec**(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. **Small**(a) $\rightarrow$ **Small**(b)
2. **Small**(b) $\rightarrow$ (**SameSize**(b,c) $\rightarrow$ **Small**(c))
3. $\neg$**Small**(b)$\rightarrow$ (**Large**(a) $\wedge$ **Large**(c))

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21. **SameSize**(b,c)$\rightarrow$ (**Large**(c)$\vee$ **Small**(c))

Bonus!!! Do this page last.

7. 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**(a) $\wedge$ **Dodec**(b)) $\rightarrow$ (**SameCol**(a,c)$\rightarrow$ **Small**(a))
2. ($\neg$**SameCol**(b,c) $\wedge$ $\neg$**Small**(b)) $\rightarrow$ (**Dodec**(b) $\wedge$ $\neg$**Small**(a))
3. **SameCol**(a,c) $\wedge$ $\neg$ **SameCol**(b,c)
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25. **Dodec**(a)$\rightarrow$ **Small**(b)