



Recitation 1

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Homework

- Homework 1 is on the web!
- Due next Wednesday at 12:00 noon
- Goals:
 - Familiarize yourselves with Tutch
 - Make sure you can submit homework



Why should we use a proof checker?

- Interesting
 - Fermat
 - Kepler
- Tedious
 - 4 Color
 - Processors
 - Programs
 - Databases



Brief History

- Principia
- Bourbaki
- McCarthy
- Automath
- LCF/HOL



ETPS examples



Quaternions

- $(p_1^2 + q_1^2 + r_1^2 + s_1^2 + t_1^2 + u_1^2 + v_1^2 + w_1^2) \cdot$
- $(p_2^2 + q_2^2 + r_2^2 + s_2^2 + t_2^2 + u_2^2 + v_2^2 + w_2^2)$
- $= (p_1 \cdot p_2 - q_1 \cdot q_2 - r_1 \cdot r_2 - s_1 \cdot s_2 - t_1 \cdot t_2 - u_1 \cdot u_2 - v_1 \cdot v_2 - w_1 \cdot w_2) \cdot$
- $(p_1 \cdot q_2 + q_1 \cdot p_2 + r_1 \cdot s_2 - s_1 \cdot r_2 + t_1 \cdot u_2 - u_1 \cdot t_2 - v_1 \cdot w_2 + w_1 \cdot v_2) \cdot$
- $(p_1 \cdot r_2 - q_1 \cdot s_2 + r_1 \cdot p_2 + s_1 \cdot q_2 + t_1 \cdot v_2 + u_1 \cdot w_2 - v_1 \cdot t_2 - w_1 \cdot u_2) \cdot$
- $(p_1 \cdot s_2 + q_1 \cdot r_2 - r_1 \cdot q_2 + s_1 \cdot p_2 + t_1 \cdot w_2 - u_1 \cdot v_2 + v_1 \cdot u_2 - w_1 \cdot t_2) \cdot$
- $(p_1 \cdot t_2 - q_1 \cdot u_2 - r_1 \cdot v_2 - s_1 \cdot w_2 + t_1 \cdot p_2 + u_1 \cdot q_2 + v_1 \cdot r_2 + w_1 \cdot s_2) \cdot$
- $(p_1 \cdot u_2 + q_1 \cdot t_2 - r_1 \cdot w_2 + s_1 \cdot v_2 - t_1 \cdot q_2 + u_1 \cdot p_2 - v_1 \cdot s_2 + w_1 \cdot r_2) \cdot$
- $(p_1 \cdot v_2 + q_1 \cdot w_2 + r_1 \cdot t_2 - s_1 \cdot u_2 - t_1 \cdot r_2 + u_1 \cdot s_2 + v_1 \cdot p_2 - w_1 \cdot q_2) \cdot$
- $(p_1 \cdot w_2 - q_1 \cdot v_2 + r_1 \cdot u_2 + s_1 \cdot t_2 - t_1 \cdot s_2 - u_1 \cdot r_2 + v_1 \cdot q_2 + w_1 \cdot p_2) \cdot$



Natural Deduction Rules

- You'll need the following rules for hw1
 - ✓ $\wedge I, \wedge EL, \wedge ER$
 - ✓ $\vee IL, \vee IR, \vee E$
 - ✓ $\Rightarrow I, \Rightarrow E$
 - ✓ $\Leftrightarrow I, \Leftrightarrow E$



Using Tutch

1. Add tutch binaries to
path/afs/andrew/scs/cs/15-399/bin
2. Download ass1.req from website
3. Write solutions in ass1.tut
4. Check solutions (tutch -r ass1)
5. Submit solutions (submit -r ass1)

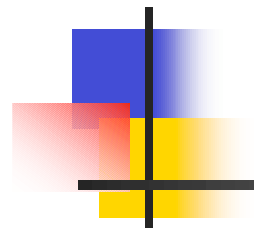


Why Natural Deduction?

✓ $\sim(A \vee A) \vee A$

✓ $\sim A \vee (B \vee A)$

✓ $\sim(\sim A \vee B) \vee (\sim(C \vee A) \vee (B \vee C))$



Demo



Hints

- Read Pfenning Ch. 2
- Do the proof in 2D format first!
- Pay particular attention to $\wedge E, \Rightarrow I$