ECN 106 Final Exam

Wednesday, March 20, 10:30am-12:30pm in this room (Giedt 1003)

- Four questions. Two questions on the material after the third Midterm (Chapters 11, 12 and 13), two questions on earlier material.

- **What you can skip:**
  - Chapter 5: No need to memorize the axioms of expected utility (Section 5.3)
  - Chapter 7: Simpson's paradox (Section 7.3)
  - Chapter 8: Belief revision and Information and truth (Sections 8.3 and 8.4)
  - Chapter 9: Different sources of information (Section 9.4)
  - Chapter 11: Proof of Arrow's theorem (Section 11.3)
  - Chapter 12: Proof of Gibbard-Satterthwaite's theorem (Section 12.4)
  - Chapter 13: The confirmation bias and The psychology of decision making (Sections 13.5 and 13.6)

Review

1. Choice under certainty. Completeness and transitivity. Ordinal utility function.

2. Choice under **un**certainty: States, outcomes, and acts. Strict/weak dominance. Difference between "*a* is a dominant act" and "*a* dominates *b*". MaxiMin. Leximin.

state →	s_1	s_2
act ↓		
a	4	8
b	3	7
c	2	5
d	5	0

state →	s_1	s_2
act ↓		
a	4	8
b	3	7
c	2	5
d	4	0

state →	s_1	s_2
act ↓		
a	4	8
b	3	7
c	2	5
d	4	0

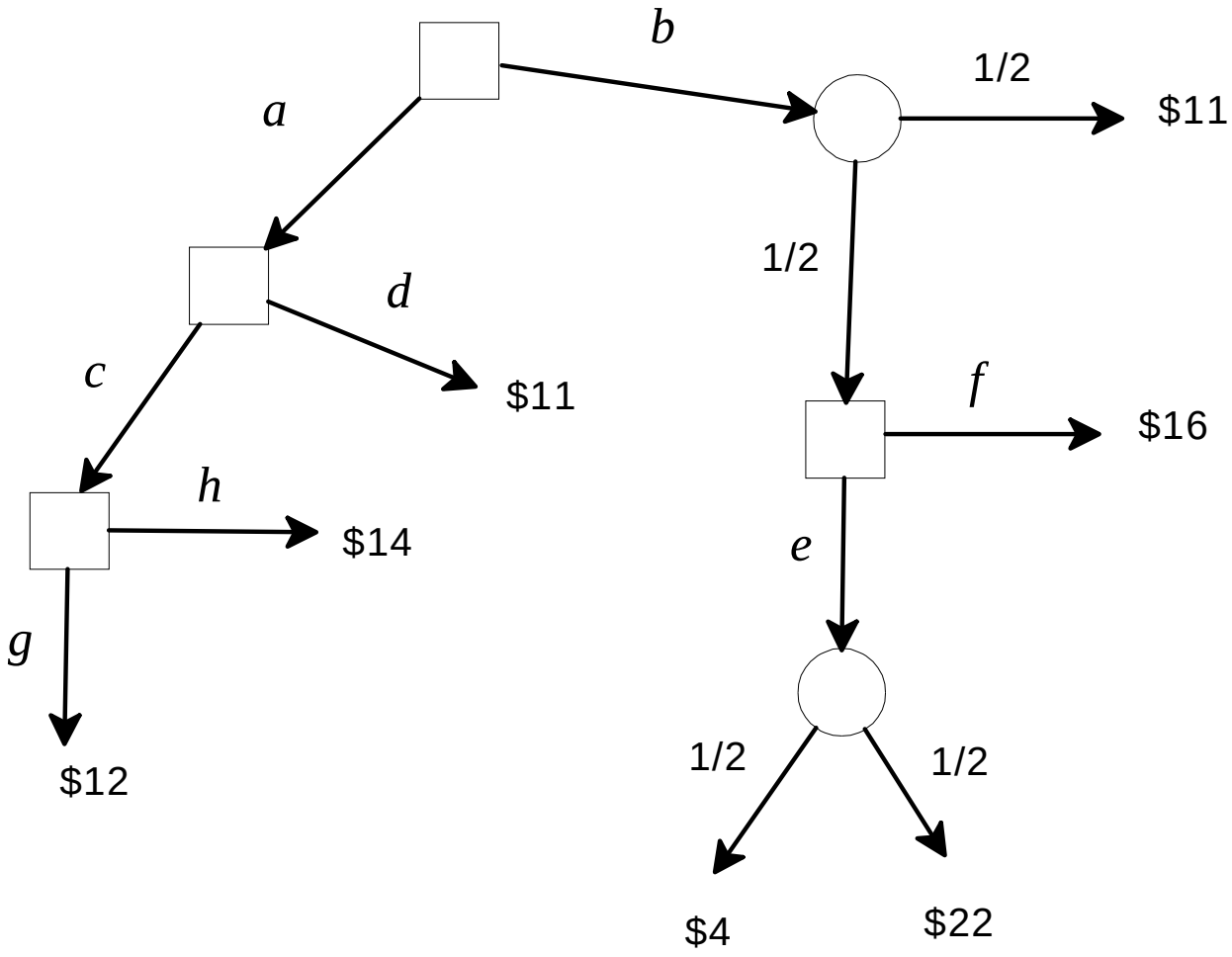
MaxiMin =

3. Attitudes to risk. Money lotteries, expected value and risk neutrality. Risk aversion. Risk love.

Ann prefers $A = \begin{pmatrix} \$15 \\ 1 \end{pmatrix}$ to $B = \begin{pmatrix} \$8 & \$20 \\ \frac{1}{2} & \frac{1}{2} \end{pmatrix}$. What is her attitude to risk?

4. Decision trees. Sequential decisions. Backward induction.

Consider a money-loving individual who faces the following decision:



5. Expected utility: Part 1. von Neumann-Morgenstern utility functions. Normalization.

Suppose there are 6 basic outcomes. What is a utility function?

Suppose $Z = \{\$9, \$16, \$25, \$36\}$. Suppose the individual is indifferent between $A = \begin{pmatrix} \$16 \\ 1 \end{pmatrix}$ and $B = \begin{pmatrix} \$9 & \$36 \\ \frac{2}{3} & \frac{1}{3} \end{pmatrix}$. Construct a vNM utility function such that $U(\$9) = 3$ and $U(\$36) = 6$.

Is it the case that $U(\$x) = \sqrt{x}$?

Suppose $Z = \{\$9, \$16, \$25, \$36\}$. What is the **normalized** utility function of a risk neutral person?

6. Expected utility: Part 2. Decision trees again. MinMax Regret with cardinal utility.

Utility:

	s_1	s_2	s_3
a	9	2	1
b	6	2	2
c	0	5	6

Regret:

	s_1	s_2	s_3
a			
b			
c			

	s_1	s_2	s_3
a	9	2	1
b	6	2	2
c	0	5	6

Hurwicz index of pessimism α

$H_\alpha(a) =$

$H_\alpha(b) =$

$H_\alpha(c) =$

For example, if $\alpha = \frac{1}{3}$ then

7. Conditional probability. Bayes' formula: $\boxed{P(E \mid F) = \frac{P(F \mid E)\,P(E)}{P(F)}}$.

Bayes' theorem: $\boxed{P(E \mid F) = \frac{P(F \mid E)\,P(E)}{P(F \mid E)P(E) + P(F \mid \neg E)P(\neg E)}}$. A simple rule for updating a probability distribution over a finite set.

8. The value of information. Perfect information vs imperfect information. Does information have the potential to change your decision? What information should be chosen?

9. Intertemporal choice: (A) the discounted utility model.

Discounting and present value. Discount factor, discount rate. Time consistency.

10. Intertemporal choice: (B) hyperbolic discounting.

Conflict between current and future preferences. Time inconsistency. Pre-commitment. Anticipating with time inconsistency: backward induction.

11. Group decision making: (A) social **preference** functions. Desirable properties (1. Freedom of expression, 2. Rationality, 3. Unanimity, 4. Independence of irrelevant alternatives, 5. Non-dictatorship). Arrow's theorem.

12. Group decision making: (B) social choice functions. Desirable properties (1. Unanimity, 2. Non-dictatorship, 3. Nonmanipulability). The Gibbard-Satterthwaite theorem.