

First Midterm Exam

Each part of a question (a, b, c, etc.) is worth 5 points. Make sure to allot your time accordingly. Total of 30 points, -1 for messiness, -2 for extreme messiness, +1 possible bonus point.

When you are finished, please keep the exam sheet and hand in your blue book. Thanks.

1. *Jumping*. (This problem from Health Economics class at UC Irvine.)

Your utility function is given by $U(C) = \ln(4C)$, where C is consumption. You make \$30,000 per year and enjoy jumping out of perfectly good airplanes.

There's a 5% chance that, in the next year, you'll break both legs and will incur medical costs of \$15,000 and will lose an additional \$5,000 from missing work because of the loss of a working pair of legs for some time.

- (a) What is your expected income without insurance? What is your expected utility without insurance?
- (b) Suppose you can buy insurance that will cover the medical expenses but not the foregone part of your salary. How much is an actuarially fair policy, and what is your expected utility if you buy it?
- (c) Suppose there is only one insurance company, and it knows your utility function perfectly. What is the most it can charge you for insurance?
- (d) Draw a graph showing the scenario described above, labeling the expected utility, expected income, the actuarially fair

insurance premium, and the maximum premium that you would be willing to pay.

2. *Martini*². The Martini is a famous cocktail that is properly made with gin and vermouth. (Vodka martinis are a horrible travesty from the 1960s and 70s.)

Let the price of gin be \$1 per ounce and the price of vermouth be \$0.40 per ounce. Let G be ounces of gin and V be ounces of vermouth.

Do everything in this problem with G on the horizontal axis and V on the vertical axis.

- (a) Suppose you maximize utility function

$$u(G, V) = G^{0.9} V^{0.1}$$

subject to a budget constraint based on the above prices and some income m which is unknown. Use the MRS to show what ratio of gin to vermouth you use to make a martini.

- (b) Suppose instead you maximize utility function

$$u(G, V) = \left(\frac{G}{25} - 1 \right)^{0.5} + V$$

subject to the same budget constraint as above (again with unknown m). Use the MRS to determine how much gin you use in a martini. Why can't you determine the ratio of gin to vermouth using just the MRS?

- (c) Bonus +1 point: Find the ratio of gin to vermouth in part (b) as a function of m .