

Place your name on the back of this sheet of paper and nowhere else. Staple your answers on the front of this sheet of paper. Failure to follow these directions will cost you 10 points. If you use double-sided printing or print on the back of scrap paper, I will give you one additional point.

Show all work on all questions.

1) (30 points) Suppose your utility function was given by $U(\text{movies, food, pens}) = 12M^{1/4}F^{1/2}P^{1/6}$. Your income is \$125. The price of a movie is \$8/M. The price of food is \$4/F. The price of pens is \$1/P. Movies take 2 hours per movie to watch. Food takes an hour to eat. Pens take no time. You have 30 hours to eat or watch movies. Find the utility maximizing quantities of the three products you are going to buy. If your income went up \$3, then approximately how much would your utility increase?

2) (10 points each) For each of the following, do all tests to see if it is a valid utility function. Continue with all tests, even if it fails an early test. State what each test result tells you.

A) $U(\text{Pizza, Burgers}) = 12P^{2/3}B^{2/3}$

B) $U(\text{Xylophones, Yaks}) = X^{1/2} + Y^{1/2}$

C) $U(\text{Computers, Jackets}) = \ln(CJ)$ Do not worry about the returns to scale test. (It does pass.)

3) (30 points) Suppose the production function is given by $Q = 32K^{1/3}L^{1/2}$. The rental rate of capital is \$8/K and the wage rate is \$12/L. Find the cost minimizing values for K and L as a function of Q. Find the value of λ as a function of Q. Find the total cost function as a function of Q. Use that to find the ATC and MC functions.

4) (10 points) Suppose you were allowed to do a transformation of the utility function in Question #1. What transformation would you do? Prove that is a valid transformation. Find $T(U(M, F, P))$.