ECON 110, Professor Hogendorn, Fall 2017

# Second Midterm Exam

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

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

1. *Revolution.* After Wesleyan, you take a job with McCoy Consulting. It was a tough decision because McCoy's big rival, Delight Consulting, was also recruiting you. And now the pressure is on because you are making a big presentation to Dolty, an auto parts manufacturer which is a perfectly competitive firm.

   (a) The perfectly competitive price of a car bumper is \$500. Dolty uses $S$ tons of steel to make $q$ units of bumpers according to the production function $q = f(S) = 1000S^{\frac{1}{12}}$. Steel is the only variable factor in this problem – you can think of it just like labor. The price of steel is \$800 per ton. What is Dolty's operating profit function $\pi(q)$?

   (b) Write down the first order condition for profit maximization and explain the economic logic behind it. You don't actually have to solve it.

   (c) After you have shown the above, a team from Delight bursts into the room. Their young leader, Trinity Amherst-Brown, says "Barn has a revolutionary new way to manage your firm. Don't think about bumpers, like these dinosaurs from McCoy! Instead, decide how much steel to buy!" She proceeds to

write operating profit function $\pi(S)$. Assuming she does this correctly, what does she write down? Show the condition for profit maximization using this function.

(d) Now it's up to you to save McCoy's reputation. Argue (in words) that the profit maximization condition for Ms. Amherst-Brown's method is exactly the same as the profit maximization condition in your method, and that Delight has no revolutionary management technique.

2. First, just a note: Say you wanted to write a long expression like $x + x^2 + x^3 + x^4 + x^5 + y$. It would be a lot quicker and totally fine just to write $x + x^2 + \cdots + x^5 + y$. Now, on to the problem:

   *The Financial Times* recently reported "Tajikistan has raised $500m from its inaugural 10-year international bond, [yielding] 7.125 per cent in the latest evidence of keen investor appetite for relatively high-yielding sovereign debt from infrequent and new issuers." The bonds have a coupon of 8%, and the first coupon is paid 1 year from now. As always, the face value is $100. Write the formula to find the current price of this bond. If this bond is so risky, why do you think the yield isn't higher?

3. Draw a supply-demand equilibrium diagram. Label the demand curve $D = MPB = MSB$, indicating no externalities on the demand side. Label the supply curve $S = MPC$. Show the competitive equilibrium quantity.

   Suppose the firms in the industry colluded together and behaved as a monopoly (with the same MPC curve that you already drew). Show the quantity they would produce.

   Now, suppose this product causes pollution when it is produced, so actually there is a negative externality in production. Is it possible that the monopoly produces the socially optimal quantity? Explain and illustrate on your diagram.