1. (3 points) Define “budget constraint” in 15 words, exactly.

**Solution:** “The budget constraint limits one’s consumption of goods, given prices and money (or time) endowments.” You can use any wording you want, as long as you include income and prices and hit 15 words, exactly.

2. (5 points) Give an example of a principal-agent relationship (you are the principal) and describe how Adverse Selection and Moral Hazard issues might arise. Suggest two strategies to overcome either or both of these issues.

**Solution:** I am buying a house and hire an estate agent to represent me. I need to ensure that the agent knows how to do his job (Adverse Selection) and that the agent will work hard on my behalf (Moral Hazard). I can counter AS by asking friends to recommend an agent who has served them well in the past or finding an agent with experience in many transactions. I can overcome MH by paying the agent on successful close of a deal (a common method of compensation) as well as watching to see if the agent answers my questions promptly and accurately.

3. (7 points) The EUR:USD exchange rate is changing. One euro bought $1.35 6 months ago; now it buys $1.28. Market traders explain that this result reflects a perception that interest rates are rising in the US and falling in Europe (due to changes in economic activity).

(a) (2 points) Show this change using (two different sets of) supply and demand curves for EUR and USD (i.e., each “money” is a good). Hint: Only one curve is shifting in each set.

**Solution:** The perception of changing interest rates leads to an increase in demand for USD (shift out) and decrease in demand for EUR (shift in). NB: Supply does not change except through central bank operations.
(b) (1 point) Are these currencies more like substitutes or complements? Why?

Solution: EUR and USD are substitutes for investors seeking interest income. Answers that discussed consumption in one country (i.e., they are complements when going from one country to another) were not correct.

(c) (1 point) Taking this situation as given, show how the supply and/or demand curve(s) for the euro change(s) when the European Central Bank announces it will be printing more euros (“quantitative easing”).

Solution: Supply of euros shifts out and interest rates drop. The demand curve does not move, but quantity demanded rises in response to the shift in supply.

(d) (3 points) How does the ECB’s action (previous question) affect interest rates (the cost of money)? Now explain (with examples) how a change in interest rates may stimulate the economy and may not stimulate the economy. (Think “on the margin.”)

Solution: As seen in the figure, interest rates drop. Lower rates may stimulate the economy by lowering the cost of investing, borrowing or hiring for businesses that are “sitting on the fence” but not for businesses that do not see profitable opportunities to expand, due to weak demand.

4. (5 points) Anne and Peter often fight when it comes to eating orders of 12 bitterballen. Anne says Peter takes her bitterballen, as she cannot stand to have more (or less) than three for every beer. Peter cannot see why she doesn’t just drink beer, which is twice as good as bitterballen to him.

(a) (2 points) Write down utility functions that reflect their preferences.

Solution: \( U_A = \min\{3\text{beer}, \text{bitterbal}\} \) and \( U_P = 2\text{beer} + \text{bitterbal} \)

(b) (3 points) Suggest a way for them to share without fighting.
5. (4 points) In class, we discussed this map:

(a) (2 points) Explain how markets will evolve (or function) differently inside the circle, as opposed to outside.

**Solution:** A higher population density allows for more exchange, given transaction costs that increase with distance, which means it’s easier to specialize (exploiting comparative advantage). Greater specialization and competition increases innovation and social surplus.

(b) (2 points) What are two benefits to people outside the circle as a result of activities inside the circle, in terms of trade.

**Solution:** People outside can benefit from the higher-quality produced in the competitive and innovative markets inside the circle. They can also trade from their comparative advantages, i.e., selling “space” (even clean environments) and resources to the busy, crowded people inside the circle.

6. (4 points) The figure below shows the relationship between “ethnolinguistic diversity” and government spending, which includes redistribution (the social safety net). Explain the relationship in terms of other-regarding preferences. Hint: Use a parameter, $\alpha$, as a measure of the strength of other-regarding preferences.
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Solution: People in homogenous societies do not mind paying for redistributive policies that benefit people “like them.” Other-regarding preferences show up in our utility functions as \( U_i = f(x_i, x_j) \), i.e., utility from own consumption \( (x_i) \) and the consumption of someone else \( (x_j) \), as modified by \( \alpha \), a parameter of “closeness” that puts more weight on others’ consumption (or utility). Holding all else equal, a larger \( \alpha \) means \( i \) gets more utility from \( x_j \), which translates into support for redistribution. It’s also easier for governments to design and implement programs when people are similar, which can increase the size of government.

7. (4 points) Landsburg says “We should encourage further literacy until the additional costs begin to exceed the additional benefits.”

Comment on this recommendation. If literacy is a private good, then why should government subsidize its provision? Can’t we expect individuals to find their own appropriate level of literacy? How do opportunity costs matter?

Solution: Literacy is a private good but it brings positive externalities (i.e., a literate population will be better at voting, commit fewer crimes, take better care of themselves, send their kids to school, etc.), which may justify a subsidy for literacy.

Individuals do not exactly “know” the benefits of literacy if they are not literate, so it’s worth subsidizing them to give them a taste of its benefits. The opportunity cost of subsidies that are too large is a lack of funding for other programs (e.g., public health, security, etc.) that may provide greater social benefits. It’s hard to see an opportunity cost to individuals unless literacy is required in an arduous, mandatory program.

8. (4 points) Give an example of when you did not take an action (“not worth it” at the margin, i.e., \( MB \leq MC \)) that you later decided to take, which turned out to be worth it. Give an example of an action taken that turned out to be worth less than you had expected.
Solution: “Not worth it,” reversed: I stopped reading *Game of Thrones* about 6 months ago because the stories just kept going and going. Then I decided I liked the endless story (for relaxation) and went back to reading it. “Worth it,” reversed: I decided to move to Vancouver from Amsterdam, but then found out Vancouver wasn’t as nice as I had imagined, so I moved back to Amsterdam. Most of you gave excellent examples, which demonstrated a good grasp of opportunity costs.

9. (4 points) There are two types of monopoly power. The first is based on innovation (e.g., *Harry Potter* books that have few substitutes). The second is based on legal protections (e.g., a telephone company that faces no competition). Discuss their relative benefits to society, in terms of consumer surplus.

Solution: An innovator who creates an unique product can make monopoly profits because there are few exact substitutes, but consumers are pleased to pay high prices because the product gives them surplus that they did not have before. Prices cannot rise TOO high before customers just stop buying the product. These profits also encourage innovation as companies see potential profits. A legal monopoly does not need to innovate (or please customers) because it lacks competition. In the absence of independent, smart regulation (not assumed to be true in this question), the monopoly may provide poor service at high prices to trapped customers.