Managerial Economics Midterm 2: Practice Exam

Midterm 2 is coming up on Tuesday, April 8th, and it will take place during class. The exam will consist of 20 short-answer questions, each worth 5 points, adding up to a total of 100 points. No calculators or notes: just bring a pencil, and you'll be all set.

To help you prepare, I've made this practice exam. The midterm will look very similar: in fact, 15 out of the 20 questions will be the same (with numbers changed, if applicable). The remaining 5 questions will be new, but they'll still come directly from the assignments or quizzes you've already worked on. So if you study the practice exam thoroughly, you're guaranteed to score at least a 75% (15/20) on the exam! That's a great starting point, and with a little extra effort, you can aim higher. I've included answers to the first 11 questions to help you check your work. For the last 9 questions, which cover Unit 3, we're still wrapping up that material. Consult the answer keys, which will be released on Friday.

This is the second of three exams. Remember that exams make up 60% of your final grade, and I'll drop your lowest exam score to give you some flexibility. If you're sick on the 8th or something comes up, there are no makeup exams: Midterm 2 will be your dropped exam. So, do your best, but don't stress. You've got this!

1) Midterm 1 Question 7

Explain what an aesthetic mapping is in ggplot.

Answer: an aesthetic mapping creates a mapping between variables in your data set and visual aesthetics in your plot, like which variables should be represented on the x or y axis, and which variables should be represented with color, fill, shape, or size.

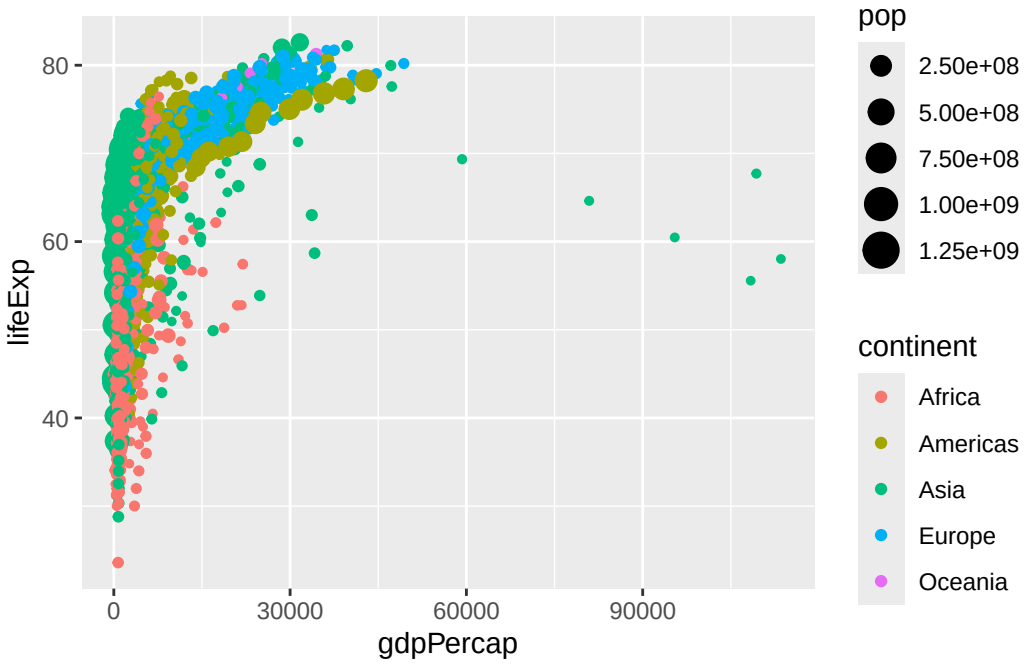
2) Midterm 1 Question 8

Write the code necessary to take gampinder and draw a scatterplot comparing gdpPercap to lifeExp. Map continent to color and pop to size. How many plot legends will there be?

Answer: 2 legends (pop and continent).

```
library(tidyverse)
library(gapminder)

gapminder %>%
  ggplot(aes(x = gdpPercap, y = lifeExp, color = continent, size = pop)) +
  geom_point()
```



3) Midterm 1 Question 16

Fill in the blank: Suppose your marginal rate of substitution between kiwis (x_1) and limes (x_2) is 0.5. Then you'd be indifferent between getting 4 more kiwis and _____ more limes.

Answer:

$$MRS = \frac{rise}{run} = \frac{\Delta x_2}{\Delta x_1} \tag{1}$$

$$0.5 = \frac{\Delta x_2}{\Delta x_1} \tag{2}$$

$$0.5 = \frac{\Delta x_2}{4} \tag{3}$$

$$\Delta x_2 = 2 \tag{4}$$

4) Midterm 1 Question 17

Use the tangency condition and budget constraint to solve for the consumer's choice given $u(x_1, x_2) = x_1^{1/2} x_2^{1/2}$, $p_1 = 1$, $p_2 = 2$, and $m = 12$. Then check your work using the Cobb-Douglas trick.

Answer (tangency condition):

$$\frac{\partial u/\partial x_1}{\partial u/\partial x_2} = \frac{p_1}{p_2} \tag{5}$$
$$\frac{1/2x_1}{1/2x_2} = \frac{1}{2} \tag{6}$$
$$\frac{x_2}{x_1} = \frac{1}{2} \tag{7}$$
$$x_1 = 2x_2 \tag{8}$$
$$\text{Plug into Budget Constraint:} \tag{9}$$
$$x_1 + 2x_2 = 12 \tag{10}$$
$$2x_2 + 2x_2 = 12 \tag{11}$$
$$x_2 = 3 \tag{12}$$
$$x_1 = 6 \tag{13}$$

Answer (Cobb-Douglas trick):

The consumer spends half of their income on good 1:

$$p_1 x_1 = 12/2$$
$$x_1 = 6$$

The consumer spends half of their income on good 2:

$$p_2 x_2 = 12/2$$
$$2x_2 = 6$$
$$x_2 = 3$$

5) Midterm 1 Question 19

Income vs Substitution. Consider the demand function $x_1 = \frac{m}{3p_1}$. Let good 2 refer to the composite good.

a) Find the consumer's demand for goods 1 and 2 if $p_1 = 1$ and $m = 12$.

Answer:

$$x_1 = \frac{12}{3(1)} \tag{14}$$
$$x_1 = 4 \tag{15}$$
$$x_2 = 12 - 4 \tag{16}$$
$$x_2 = 8 \tag{17}$$

b) Now find the consumer's demand for goods 1 and 2 if $p_1 = 2$ and m is still 12.

Answer:

$$x_1 = \frac{12}{3(2)} \tag{18}$$
$$x_1 = 2 \tag{19}$$
$$x_2 = 12 - (2 \times 2) \tag{20}$$
$$x_2 = 8 \tag{21}$$

c) Comparing parts a and b, what is the total change to the demand for good 1 Δx_1?

Answer: decreases by 2

d) Now we'll decompose the total change Δx_1 into two parts: the substitution effect versus the income effect. Start with the substitution effect: the change in demand for good 1 due only to the change in relative prices, and not the change in purchasing power. The first step is to find m': under the new prices ($p_1 = 2$), what would the consumer's income need to be to just afford their initial choice from part a?

Answer: The choice is (4, 8). At prices (2, 1), the consumer needs $m' = 16$.

e) Find the consumer's demand x_1^S for good 1 under the new prices ($p_1 = 2$) and under m'. I'll call this x_1^S to indicate this is the demand due to substitution (purchasing power held constant).

Answer:

$$x_1 = \frac{16}{3(2)} \tag{22}$$
$$x_1 = \frac{8}{3} \tag{23}$$

f) The difference between x_1 in part A and x_1 in part E is the substitution effect. The difference between x_1 in part E and x_1 in part B is the income effect. Report these values; which was larger in magnitude?

Answer:

Substitution effect: demand changes from 4 to 8/3 (2.67). The difference is 1.33.

Income effect: demand changes from 2.67 to 2: the difference is 2/3.

The substitution effect is larger in magnitude.

6) 4.1 Question 2

For each of these scenarios, make a prediction about whether the supply curve for the good will shift to the right or to the left.

a) If the price of steel increased significantly, what would happen to the supply curve for cars?

b) If a new technology reduced the cost of producing solar panels, what would happen to the supply curve for solar panels?

c) If wages for factory workers increased significantly, what would happen to the supply curve for manufactured goods?

d) If the government subsidized the production of electric vehicles (EVs), what would happen to the supply curve for EVs?

e) If a drought increased the cost of irrigation for farmers, what would happen to the supply curve for agricultural products like wheat?

Answers:

a) Shifts left (higher input costs reduce supply).
b) Shifts right (lower production costs increase supply).
c) Shifts left (higher labor costs reduce supply).
d) Shifts right (subsidies lower production costs and increase supply).
e) Shifts left (higher costs of production reduce supply).

7) 4.2 Question 1

In each part, identify which of the two goods is more likely to be **inelastically** demanded.

a) Demand for tangerines; demand for fruit
b) Demand for Exxon gasoline at the corner of 7th and Grand; demand for gasoline in the entire city
c) Demand for insulin; demand for vitamins
d) Demand for coffee; demand for Starbucks coffee
e) Demand for textbooks for required courses; demand for novels for leisure reading
f) Demand for gasoline in the short term; demand for gasoline in the long term

Answers:

a) demand for fruit
b) demand for gasoline in the entire city
c) Demand for insulin
d) Demand for coffee
e) Demand for textbooks for required courses
f) Demand for gasoline in the short term

8) 4.3 Question 4

One way governments have tried to collect taxes from the wealthy is through the use of luxury taxes, which are exactly what they sound like: taxes on goods that are considered luxuries, like jewelry or expensive cars and real estate. The problem is that the demand for luxuries is very elastic. Is a luxury tax more likely to hurt the buyers of jewelry, or the sellers of jewelry?

Answer: A luxury tax will hurt the sellers of jewelry.

9) Unit 4 Quiz C Question 1

Why can't you estimate supply or demand just by looking at data on prices and quantities exchanged?

Answer: Because each price-quantity point is determined by the intersection of both supply and demand curves in equilibrium. Without a shifter that affects only one curve, you can't tell which curve is which.

10) 4.5 Questions 1 and 2

Consider a supply curve given by the equation $p = \frac{q}{20}$ and a demand curve given by $p = 25 - \frac{q}{20}$.

a) Find the equilibrium price and quantity exchanged.
b) Suppose the government imposes a \$5 price ceiling on the market. That is, you can't sell the good for more than \$5. This prevents the market from reaching equilibrium. At the price of \$5, the quantity demanded is ____ and the quantity supplied is ____. There is a (surplus/shortage). In response, sellers realize they can cut product quality and still sell everything they want to sell. Buyers form long lines and waste time and money searching for ways to get at least a little of the good.

Answers:

(p, q) = (\$12.5, 250)

At the price of \$5, the quantity demanded is **400** and the quantity supplied is **100**. There is a **shortage**. In response, sellers realize they can cut product quality and still sell everything they want to sell. Buyers form long lines and waste time and money searching for ways to get at least a little of the good.

11) 4.6 Questions f-i

Consider the American Automotive industry. In 2023, the U.S. produced 10.6 million motor vehicles, and exported 1.65 million cars to other countries (mostly to Canada). Canada and Mexico produce more than half of the individual car parts that American automakers import every year. President Trump has just put a blanket tariff of 25% on imported goods from Canada and Mexico. Canada has responded by announcing it will apply a 25% tariff on US imports. Mexico is also threatening to retaliate in a similar way.

a) The U.S. tariffs on imports will (help/hurt) domestic car producers by raising the price of cars here in the U.S.

   Answer: help

b) But the U.S. tariffs on imports from Canada and Mexico will (help/hurt) domestic car producers because they are the *buyers* of car parts from Canada and Mexico, so producing cars in the U.S. will become more expensive.

   Answer: hurt

c) And because Canada has applied a retaliatory 25% tariff on U.S. imports, U.S. companies will see much (more/less) demand for cars coming from Canadian consumers.

   Answer: less

d) Consumers in the U.S. also (win/lose) in more ways than one: car prices will certainly (increase/decrease), as will the price of any other product that is imported from Canada or Mexico (or China, for which we've also raised tariffs).

   Answer: lose; increase

12) 5.1 Question 3

Explain how you could use marginal thinking to decide how many employees to hire. What is the marginal benefit and the marginal cost in this context?

13) Unit 5 Quiz B

What does the Marginal Rate of Technical Substitution (MRTS) measure?

14) 5.3 Questsion 8

Assuming the market price for a price-taking firm's output good is \$6 and the firm's total cost function is given by $TC = 400 + 2q + \frac{q^2}{300}$, find the firm's profit maximizing level of output and the total profit they generate. Show your calculations.

15) 5.4 Question 6

A firm uses labor (L) and capital (K) to produce output (Q) according to the production function: $Q = 10L^{0.5}K^{0.5}$. The wage rate (w) is \$16 per unit of labor, and the rental rate of capital (r) is \$4 per unit of capital.

a) Use the tangency condition or Cobb-Douglas trick to show that the optimal ratio of L to K is $K = 4L$.
b) If the firm wants to produce 100 units of output, find the optimal quantities of L and K.
c) Calculate the total cost of production for 100 units of output.

16) Unit 5 Quiz C Question 2

If you double all inputs in a production process and get exactly double the output, what type of returns to scale does this represent?

17) Unit 5 Quiz D

Under free entry and exit in a competitive market, what profit level will firms earn in the long run?

18) 5.7 Question 1

a) If demand is given by $P = 60 - Q$ and the monopolist's marginal cost is \$20 per unit, find the monopolist's Q, P, and π.

b) Continuing from part a, find the Q, P, and π under perfect competition.

c) Compare: under a monopolist, the price is (higher/lower), the quantity exchanged is (higher/lower), and the profit to firms is (higher/lower).

19) Unit 5 Quiz E Question 6

What are the two major factors examined in the Comanor and Wilson 1967 study that influence market power and profit rates?

20) 5.10 Question 1

- Market demand: $P = 100 - Q$
- Two identical firms with marginal cost $MC = 20$

If the cartel acts as one entity and maximizes joint profits, they make the same (P, Q) decision as a monopolist would. Just as a monopolist restricts output to drive up prices, a cartel restricts each member's output to achieve the same goal.

a) Suppose the two firms form a cartel and act like a monopolist. Calculate:

   - The profit-maximizing quantity and price
   - Each firm's profit if they split the market equally

b) Despite high profits, cartels are inherently unstable. Let's see why:

   - Suppose one firm "cheats" by producing 5 more units than they are supposed to according to the cartel agreement you found in part a. Find the new market quantity, find the new market price, and calculate profits for the cheating firm and the firm who stays true to the agreement. In this cartel, do firms have an incentive to cheat by producing more than their quota?