Name: _____ ELP 390G Denning

Problem Set 9 – Competition and Accountability

*Estimated time: about ninety minutes. Type your responses and submit a single PDF *ON CANVAS*. Show your work on anything you compute. Label all axes and key points on graphs. A photo of a hand-drawn sketch is fine.*

Part 1: Market Power

1. A regional public college is the only four-year institution within a two-hour drive. Inverse demand for its seats is

$$P = 30 - 3Q$$

with tuition P in thousands of dollars and enrollment Q in thousands of students. Marginal cost is \$6,000 per student and does not vary with enrollment.

   (a) Write total revenue and derive marginal revenue. Explain in one or two sentences why MR lies below P at every quantity.

   (b) Find the college's enrollment and tuition. Graph D, MR, and MC, marking both.

   (c) What enrollment and tuition would a price taker choose?

   (d) How much does the college earn above cost?

   (e) How many students valued a seat above what it costs to provide, and did not get one? Mark them on your graph, and explain how you know the student at the competitive quantity is the last one worth enrolling.

   (f) Explain why the college leaves those students out even though every one of them would pay more than \$6,000.

   (g) Compare your answers to (b) and (c). The college enrolls exactly half the competitive number. Show why that happens for any straight-line demand curve with constant marginal cost.

   (h) The legislature caps tuition at \$12,000. How many students enroll now? Compare with (b), and explain why a price ceiling on this college does something it would never do in a competitive market. What cap would produce the competitive enrollment, and what happens below it?

2. Below are six features of a state's K–12 system. For each, state (i) which of the three conditions for monopoly it helps sustain — one seller, no close substitutes, or barriers to entry — and (ii) which of the three remedies, if any, attacks it.

   (a) Children are assigned to a school by home address.

(b) State law permits no more than twenty charter schools statewide.

(c) A new school must find and finance its own building.

(d) No transportation is provided to any school outside a child's zone.

(e) The state's report card publishes average scores only.

(f) The next district's nearest school is a forty-five minute drive away.

Then: rank (a) through (f) by how much removing each would improve schooling in a dense city of 300,000. Redo the ranking for a county of 4,000 with one high school. Explain what drives the difference between your two rankings.

Part 2: From Seats to Quality

3. A district school may choose a quality level q from 0 to 6. Producing each additional unit costs the amounts below, and each is worth the stated amount to the children in the building. All figures are in thousands of dollars.

Unit of q	1st	2nd	3rd	4th	5th	6th
MC	200	250	300	350	400	450
MB_{social}	600	560	520	480	440	400

(a) What is the efficient quality level? Show the comparison that decides the last unit.

(b) The school is a protected monopoly: 800 children are assigned to it whatever it does, and no one's pay or job depends on quality. What is the marginal benefit *to the school* of each unit, and what q does it choose? Explain why this school is optimizing rather than shirking.

(c) The state authorizes charter schools. Enrollment now depends on quality: 600, 680, 745, 795, 830, 850, and 860 children as q runs from 0 to 6, and each child brings \$9,000 in funding. Compute the school's MB for each unit and find its q.

(d) Return to the protected district in (b). Instead of charters, the state introduces a rating system worth \$290,000 per unit of quality, with no effect on enrollment. Find q.

(e) Now apply the rating system and charter entry together. Find q and compare it with your answer to (a).

(f) Put (b), (d), and (c) in order of the quality they produce. Then explain why neither remedy alone reaches the efficient level but the two together do.

(g) The state can afford only one of the two remedies and must apply it in the county of 4,000 from Problem 2. Which, and why is the other not available there?

Part 3: Measuring Quality

4. A school has 1,200 instructional hours to allocate. Each hour spent on tested subjects produces 0.5 units of tested achievement; each hour spent on everything else produces 0.25 units of untested achievement. The school currently splits its hours 700 tested / 500 untested.

   (a) Draw the school's production possibilities frontier with tested achievement on the horizontal axis. Give both intercepts and mark the current point.

   (b) An accountability system arrives and the school reallocates to 1,000 tested / 200 untested. Find the new point. What is the measured gain and the unmeasured loss?

   (c) Return to the original split. Instead of reallocating, the school adopts a genuinely better method: every hour now produces 0.6 units of tested or 0.3 units of untested achievement. Keeping 700/500, find the new point and describe what happened to the frontier.

   (d) You have data on tested scores only. Can you distinguish (b) from (c)? Name one variable that would settle it, and say why it has to come from outside the accountability measure.

   (e) A third school reports a mean score instead of improving anything. It tests 150 children with a mean of 50, then excludes the 30 lowest scorers, whose mean is 30, from the reported figure. Compute the reported mean and the change. How much did anyone learn?

   (f) Of the three behaviors in (b), (c), and (e), which does a state most want, and which is hardest to detect in the data the state collects? What does that imply about evaluating an accountability system on test scores alone?

5. A state rates each school on the number of children scoring at or above 500. Tutoring raises any child's score by exactly 20 points. One school's children currently score:

   430, 455, 482, 486, 492, 497, 505, 518, 534, 560

   (a) If the school had unlimited tutoring slots, which children would raise its rating?

(b) The school has two slots. Who gets them? Identify every child who is passed over and give the two distinct reasons a child can be passed over.

(c) The state switches to rating schools on the mean score. Redo (b). Which rule would you choose, and what does the one you reject do better?

(d) Two schools report the following. School A: average score 540, average annual gain 8 points. School B: average score 470, average annual gain 22 points. Which looks better on a report card that publishes average scores? Which is teaching children more? Explain the difference between the two statistics.

(e) The state publishes levels only. Predict what School B's principal can do to raise the published number without teaching anyone more, and name the term from lecture for it.

6. True or False, and explain in one or two sentences each.

(a) "A school district cannot be a monopoly, because it earns no profit."

(b) "A price ceiling always reduces the quantity supplied."

(c) "Test scores rose after the accountability system took effect, so schools became more productive."

(d) "A county with one high school cannot be helped by any of the three remedies."

(e) "Funding that follows the child is fiscally neutral for the district she leaves."