There are seven problems on this test. You must answer all of the problems to get full credit. Please read the problems carefully and label all of your graphs. You have 180 minutes to finish this test. Good luck and enjoy the summer!

1. (9) The following problem refers to the article about Yale and Harvard.
   a. (5) Summarize the article and explain how it relates to a perfectly competitive labor market and one with monopsony power (explanations only, no graphs).

   The article discussed the lower pay and lower benefits that employees earned at Yale relative to Harvard. Economically this can be explained by observing that Yale has some monopsony power in New Haven (1 out of every 5 jobs in New Haven) while Harvard competes in a relatively competitive labor market. Yale’s monopsony power enables them to offer a lower wage and less benefits.

   b. (4) Assuming Boston is a perfectly competitive labor market and Yale has a monopsony in the New Haven market, illustrate the labor market for Boston and New Haven. Also, illustrate the firm specific demand for labor for both Yale and Harvard.
2. (9) This problem addresses pricing with market power.
   a. (5) Explain how peak-load pricing differs from third-degree price discrimination.
      Provide a real world example of each.
      
      Peak-load pricing ≠ 3rd Degree are similar b/c they separate people into groups. Peak-load is different b/c the price in each group is a reflection of the MC and not just an attempt to capture consumer surplus from different demand curves.
      
      3rd Degree - movie theaters - different prices for students, children, adults, senior citizens.
      Peak-load - ski resorts on weekends - higher price, must employ more people to serve ↑ customers.
      
      b. (4) Explain how the EWEB article that we discussed in class is an example of second-degree price discrimination. How was the example different than our "typical" examples of second-degree price discrimination?
      
      There were different prices for different quantity blocks. Specifically, consumers were charged a higher price for greater quantities. This differs from our typical example b/c of the PP with ↑Q and b/c the example discussed issues such as conservation and equity when we normally only discuss profit max. as a decision factor.
3. (14) This problem addresses the oligopoly market. Suppose \( P(Q) = 1400 - Q \) (where \( Q = q_1 + q_2 \)),
\( C(q_1) = 500q_1 \), and \( C(q_2) = 200q_2 \).

a. (6) List the profit functions and reaction functions for both firms assuming Cournot
competition. Solve for the Nash Equilibrium (firm quantities and market price) and
explain intuitively why it is a Nash Equilibrium.

\[
\text{Profit}_1 = (1400 - q_1 - q_2)q_1 - 500q_1, \quad \text{Profit}_2 = (1400 - q_1 - q_2)q_2 - 200q_2
\]

\[
RF_1: q_1 = \frac{900 - q_2}{2} \quad RF_2: q_2 = \frac{1200 - q_1}{2}
\]

\[
q_1^* = 200, \quad q_2^* = 500 \quad P = 700
\]

This is a N.E. b/c neither \( \text{firm} \) has a
profit incentive to change its quantity selection
given the other is producing \( q_1^* \) (the point
of intersection between \( RF_1 \) & \( RF_2 \)).

b. (5) Solve for the Nash Equilibrium (firm quantities and market price) assuming a
Bertrand model with one dollar increments. Explain why it is a Nash Equilibrium.

\[
\text{Firm 2} \quad p = \$499 \quad \text{Firm 1's AVC} = 1
\]

\[
q_2 = 901, \quad q_1 = 0. \quad \text{Neither \( \text{firm} \) has an incentive to change any other price. If
\( \text{Firm} \ 2 \) \ raise \ price, it would have to split the demand
with \( \text{Firm} \ 1 \). If \( \text{Firm} \ 1 \) matched this price (499)
its profits < 0.
\]

c. (3) Explain which equilibrium represents a more "competitive" outcome.

\text{Bertrand is more competitive in the sense that there is a U Price, } \uparrow Q \text{ in the market. This is true despite the
fact that there is only one firm
producing (counter intuitive to a structuralist).}
4. (5) List the profit maximizing choice of advertising as a function of elasticity of advertising and firm-specific elasticity of demand (rule of thumb advertising). Provide an intuitive explanation for this mathematical relationship between each elasticity and the profit maximizing level of advertising.

\[ \frac{E_A}{E_d} = \frac{A}{P \cdot Q} \]

As \( E_A \) ↑ you should A more: as people are more responsive to advertising you should advertise more.

As \( E_d \) ↑ you should A more: advertising will ↑ costs \( \rightarrow \) Price. Thus you should advertise more with a relatively inelastic good (\( P - MC \) is also ↓)

5. The following game features two firms, Firm 1 and Firm 2. Firm 1 is uncertain about whether Firm 2 is a high cost or a low cost firm and attaches a probability of \( \beta \) that Firm 2 is a high cost firm and a probability of \( 1 - \beta \) that Firm 2 is a low cost firm. The strategies and payoffs are listed as follows (Firm 2 cost, Firm 1 quantity, Firm 2 quantity, Firm 1 profit, Firm 2 profit): (high, high, high, 100, -100) (high, high, low, 200, 100) (high, low, high, 150, -50) (high, low, low, 250, 150) (low, high, high, 300, 300) (low, high, low, 350, 250) (low, low, high, 250, 350) (low, low, low, 325, 325).

a. (2) Represent this game in game tree form.

b. (4) For what values of \( \beta \) would Firm 1 choose to produce a high quantity?

\[ \text{Expected Payoff} \]

\[ \begin{align*}
\text{High} &: 200B + (1-B)300 \\
\text{Low} &: 250B + (1-B)250 \\
\end{align*} \]

\[ \begin{align*}
300 - 100B & \geq 250 \\
\frac{50}{100} & \geq B \\
B & \leq 0.5
\end{align*} \]
6. (4) Provide a real world example of a market with asymmetric information (explain who has more information). What have the market participants done to provide additional information in your example?

Answers will obviously vary. We discussed the used car market (sellers knew more about the car than buyers) and the labor market (employees knew more about skills etc than employers). Used cars—sellers can signal quality through warranties. Buyers can take the car to a mechanic or access websites such as castax.com

7. (3) Using a firm-specific demand for labor graph, illustrate and explain the concept of efficiency wages (make sure to list the elements of the firm-specific demand).

![Diagram showing a firm-specific demand for labor graph]

- Efficiency wage: \( \uparrow \) wage \( \rightarrow \) \( \uparrow \) productivity
- Worker recognizes cost of shirking has \( \uparrow \), thus willing to work harder (\( \uparrow \) \( MPL \)).