You have three hours. **SHOW WORK** where calculations are required. Use lined sheets for your work and essays.

A. Multiple Choice (80 pts) Place (A, B, C, D or E) in the space on the exam paper. Only one answer for each.

1. **B** If demand increases, but supply decreases:
   A. Both price and quantity exchanged will increase.
   B. Price will increase, but we don’t know what will happen to quantity exchanged.
   C. Quantity exchanged will increase, but we don’t know what will happen to price.
   D. Both price and quantity exchanged will decrease.
   E. Price will increase but quantity exchanged will decrease.

2. **A** Suppose two goods are produced together in one process (i.e. complements in supply). If there is a rise in the demand for one of the goods, what will happen to the other good?
   A. Its cost of production will be reduced.
   B. Its supply curve will shift to the left.
   C. Its demand curve will shift to the right.
   D. Its demand curve will shift to the left.
   E. This will cause a rise in the price (which is a movement along each curve and not a shift of any curve.)

3. **D** Suppose two goods have a negative cross elasticity with each other. If there is a rise in the cost of producing one of the goods, what will happen to the other good?
   A. Its cost will rise too.
   B. Its supply will shift right.
   C. Its demand will shift right.
   D. Its demand will shift left.
   E. We can’t tell which curve will shift unless we can tell if these are normal or inferior goods.

4. **B** The less elastic the supply:
   A. The greater the dead weight loss from a price ceiling.
   B. The greater the consumer surplus from a price ceiling.
   C. The smaller the producer surplus from a price ceiling.
   D. The greater the cost of the price ceiling to the government.
   E. The larger the change in the quantity consumed.

5. **C** Suppose we replace a price floor (where the government buys the surplus) with an equivalent subsidy so that the quantity produced is exactly the same as it was with the old price floor. Then:
   A. The dead weight loss is the same as with the price floor.
   B. The consumer surplus is the same as with the price floor.
   C. The producer surplus is the same as with the price floor.
   D. The cost to the government is the same as with the price floor.
   E. The quantity consumed (by consumers) is the same as with the price floor.

6. **A** Currently you are spending all your money. If the marginal utility of the last dollar you spent on X is greater than the marginal utility of the last dollar you spent on Y, this means:
   A. You can get more happiness by reducing the amount of Y you buy and increasing the amount of X you buy.
   B. You can get the same happiness and save some money if you reduce the amount of X you buy and increase Y.
   C. At this point, your budget constraint must be steeper than your indifference curve.
   D. You are not on your output expansion path.
   E. At this point, the indifference curve is tangent to your budget constraint.

- **D** What is a price consumption curve for X?
   A. The combinations of X and Y that give you the greatest utility as your income varies.
   B. The line which you get when you set the slope of the indifference curve equal to the slope of the budget line.
   C. A relationship of maximum utility between X on the X-axis and P on the Y-axis.
   D. A relationship between X on the X-axis and Y on the Y-axis that gives you the maximum utility as the price of X varies.
   E. The curve which divides the change in X between the income and substitution effects.
8. **E** If the price of both X and Y rise by 10% but incomes is the same, what happens to the budget constraint?
   A. It becomes steeper.
   B. It becomes flatter.
   C. We can’t tell if it is steeper or flatter unless be know what happens to the marginal rate of substitution.
   D. It shifts outward in a parallel fashion.
   E. It shifts inward in a parallel fashion.

9. **D** Suppose you consume a certain combination of X and Y. Then you increase your consumption of Y but X stays the same. Comparing the old point to the new point:
   A. The marginal rate of substitution (X on the X-axis) must have decreased. (Become less negative).
   B. The marginal utility with respect to X must have decreased.
   C. The total utility must have decreased.
   D. The marginal utility with respect to Y must have decreased.
   E. The slope of the budget constraint must have decreased.

10. **C** Suppose X is an inferior good and the price of X falls:
    A. You will buy more X because of the price rise.
    B. You will buy less X because of the price rise.
    C. The substitution effect will be an increase in X.
    D. The income effect will be an increase in X.
    E. The income effect will be larger than the substitution effect.

11. **D** Suppose K is fixed in the short run. What is true about the total product curve (X=f(L))?
    A. At the steepest point on the TP curve, the average product is equal to the marginal product.
    B. If you draw a straight line from the origin to the TP curve, the tangency point is the highest marginal product.
    C. At the steepest point on the TP curve, the average product is greater than the marginal product.
    D. At L above the tangency point of the straight line from the origin, MP is less than AP.
    E. At the tangency point of the straight line from the origin, the marginal product is at its maximum.

12. **C** You want to find the cheapest way to produce a certain amount of X when both inputs can vary. The cheapest method will occur when:
    A. The ratio of capital to labour is equal to the ratio of the price of capital to the price of labour.
    B. The output expansion path will have the same slope as the isoquants.
    C. The marginal product of the last dollar spent on capital is equal to the MP of the last dollar spent on labour.
    D. When the marginal rate of substitution between X and Y is the same as the slope of the budget constraint.
    E. When the marginal rate of technical substitution is equal to the iso-cost.

13. **E** Suppose along the output expansion path, a 10% increase in the amount of labour and capital used causes the output that can be produced to increase by 10%. Then:
    A. The long run marginal cost curve will be equal to the short run marginal cost curve.
    B. The short run marginal cost curve will have a negative slope.
    C. The long run marginal cost curve will always be above the long run average cost curve.
    D. The short run marginal cost curve will always be above the short run average cost curve.
    E. The minimum point of the short run average cost curve will be on the long run average cost curve.

14. **A** When the amount of capital is fixed, the average product curve has a positive slope for a certain range of labour. For the output produced with this labour:
    A. The average cost curve has a negative slope.
    B. The average variable cost can have a positive slope or negative slope.
    C. The average cost curve can have a positive slope or negative slope.
    D. The marginal cost curve will have a positive slope.
    E. The average fixed cost will have a positive slope.
15. C Suppose K is fixed in the short run and we are using a level of L that is greater than the output expansion path. At this level of L,
   A. The short run marginal cost is below the long run marginal cost.
   B. The short run marginal cost is below the short run average cost.
   C. The short run average cost is above the long run average cost.
   D. The long run average cost curve has a negative slope.
   E. The short run average cost curve has a negative slope.

16. C Suppose the price is below the minimum point on the average cost curve but above the minimum point on the average variable cost curve. Then:
   A. The company should increase the amount of X it produces to increase profits.
   B. The company should decrease the amount of X it produces to increase profits.
   C. The company should produce the amount of X where price equals marginal cost.
   D. The company should shut down to reduce losses.
   E. The company should reduce fixed costs to reduce losses.

17. C Suppose all the firms in a perfectly competitive industry are making losses. We predict that as we move to the long run:
   A. The number of firms will increase.
   B. Each firm left will produce X at a lower average cost.
   C. Each firm will produce X at a lower marginal cost.
   D. The price of this product will decrease.
   E. Each firm left will produce less X than before.

18. A When a monopoly is maximizing profit:
   A. The price the monopoly charges will be greater than the marginal revenue.
   B. The marginal revenue will be greater than the marginal cost.
   C. The marginal cost must be greater than the average cost.
   D. The marginal revenue must be greater than the average cost.
   E. The price must be less than the marginal cost.

19. C Suppose there is a decrease in demand (but no change in costs) for a product produced by a monopoly. We predict:
   A. The monopoly will now be making a loss.
   B. The monopoly will be producing X at a lower average cost.
   C. The monopoly will be producing X at a higher average cost.
   D. The monopoly will have a higher price to maximize profit.
   E. The monopoly will have a lower price to maximize profit.

20. B Suppose by luck, the monopoly maximizes profit by producing X that is the minimum point on a short run AC curve. This means:
   A. The monopoly is making zero profit (at this break even point).
   B. At this X, the monopoly’s marginal revenue will be equal to average cost (not just marginal cost).
   C. The price the monopoly charges will be equal to the marginal revenue.
   D. The DWL comparing the monopoly to competition will be zero.
   E. At this point marginal revenue will be greater than price.
B. Comparative Statics (26 pts) Let the market for olives be:

<table>
<thead>
<tr>
<th>Price</th>
<th>Quantity Demanded</th>
<th>Quantity Supplied</th>
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</thead>
<tbody>
<tr>
<td>3</td>
<td>66</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>54</td>
<td>9</td>
</tr>
<tr>
<td>7</td>
<td>42</td>
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<td>11</td>
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<td>27</td>
</tr>
<tr>
<td>13</td>
<td>6</td>
<td>33</td>
</tr>
<tr>
<td>15</td>
<td>Etc.</td>
<td>Etc.</td>
</tr>
<tr>
<td>17</td>
<td>Etc.</td>
<td>Etc.</td>
</tr>
<tr>
<td>19</td>
<td>Etc.</td>
<td>Etc.</td>
</tr>
</tbody>
</table>

1. Calculate the elasticities of demand and of supply at equilibrium. Are the demand and supply curves elastic or inelastic at equilibrium?

- Demand elasticity: \( \frac{Q_d}{Q_d} \)
- Supply elasticity: \( \frac{Q_s}{Q_s} \)

2. Calculate the income elasticity if the demand shifts to: \( Q_d = 115 - 8P \) when income rises by 10%. What is the economic term for a good with this characteristic?

3. Complete this table showing the effects of $3 per unit tax on olives:

<table>
<thead>
<tr>
<th>( P_c )</th>
<th>( P_p )</th>
<th>( Q_c )</th>
<th>( Q_p )</th>
<th>(\Delta CS)</th>
<th>(\Delta APS)</th>
<th>(\Delta GR)</th>
<th>DWL</th>
</tr>
</thead>
<tbody>
<tr>
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<td>8</td>
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<td>10</td>
<td>20</td>
<td>-1/5</td>
<td>-2/6</td>
<td>+5/4</td>
<td>6</td>
</tr>
<tr>
<td>14</td>
<td>16</td>
<td>12</td>
<td>22</td>
<td>-1/6</td>
<td>-2/7</td>
<td>1/5</td>
<td>1.5</td>
</tr>
</tbody>
</table>

C. Utility (23 pts) Let \( U = 5XY - X(5Y - 1) \), \( MU_x = 5Y - 1 \), \( MU_y = 5X \) \( I = 76 \), \( P_x = 9 \), \( P_y = 20 \)

1. \( Y = 2, X = 4, U = 36 \) Find equilibrium \( X, Y \) and \( U \) \( I = 76 \), \( P_x = 9 \), \( P_y = 20 \)

2. \( Y = 2, X = 18, U = 162 \) Find the new equilibrium \( X', Y' \) and \( U' \) if \( P_x \) decreases to \( 2 \)

4. \( X = \sqrt{72} = 8.486, Y = 1.0485 \) Find the intermediate point (both \( X \) and \( Y \)) for the same happiness as in #1 but with \( P_x = 2 \) (HINT: It’s easier to solve for \( X \) first.)

5. Draw a rough diagram showing the results of #1, #2 with the appropriate indifference curves, budget constraint and ICC curves. Carefully label these and then mark the intermediate point (#4). Also mark the income and substitution effects of the increase in the price of \( X \).
D. Production (32 pts) Let \( X=L^{1/3}K^{2/3} \), (MP\(_L\)=\((1/3)L^{-2/3}K^{2/3}\), MP\(_K\)=\((2/3)L^{1/3}K^{-1/3}\) w\(_L\)=\$2, w\(_K\)=\$500

1. \( TC = 2(25L) + 500(\frac{K}{3}) = 150X \) Find the equation for the long run total cost curve.

2. \( TC = 2(\frac{3X}{10}) + 500(10) = 5000 + \frac{X^2}{50} \) Find the equation for the short run total cost curve when \( K = 10 \).

3. Complete the table below...

<table>
<thead>
<tr>
<th>POINT</th>
<th>X</th>
<th>K</th>
<th>L</th>
<th>TC</th>
<th>AC</th>
<th>MC</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
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<td>8</td>
<td>1000</td>
<td>6000</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>B</td>
<td>40</td>
<td>10</td>
<td>640</td>
<td>6280</td>
<td>157</td>
<td>96</td>
</tr>
<tr>
<td>C</td>
<td>50</td>
<td>10</td>
<td>1250</td>
<td>7500</td>
<td>150</td>
<td>150</td>
</tr>
</tbody>
</table>

4. Draw a rough diagram showing all the appropriate isoquants, isocosts and the output expansion path. Label these and the POINTS A, B, and C. The purpose of this diagram is to show how these points fit together so show their relationship to each other clearly and carefully.

5. Draw a rough diagram showing all the appropriate average and marginal cost curves (both long run and short run). Carefully label the curves and POINTS A, B, and C. The purpose of this diagram is to show how these points fit together so show their relationship to each other clearly and carefully.

If \( P = \$216 \), how much \( X \) should you produce (if you were one firm in a perfectly competitive industry). How much profit would you make?

\[ 216 = \frac{3X^2}{50} \]
E. Industrial Structure (19 pts) Let Variable Cost= \(2X^2 + 8X + 32\), Fixed Cost=96 and \(Q_d=304\) (industry)

\[MC=4X+8\quad X= \frac{P-8}{4}\quad TC=698\quad TR=17168=1020\]

3. \(X=15\), \(P=322\) If \(P=68\) in this perfectly competitive industry, how much quantity should a firm produce and how much profit would this firm make? \(\text{TC}=408\quad \text{TR}=480-40=472\)

4. \(P=48\), \(X=10\), \(P=72\) In the short run there are 16 identically sized firms in this perfectly competitive industry. Find the equilibrium price, quantity per firm and profit per firm.

4. \(X=8\), \(P=40\), \(AC=2X+8+12\frac{x}{x}\) Suppose there is free entry by as many identically sized firms as want to enter this perfectly competitive industry. What will the long run price, quantity per firm and number of firms be?

4. \(X=20\), \(P=94\frac{2}{3}\), \(\Delta WL=-6892\frac{2}{3}\) If a monopoly gained control of this industry, what price would the firm set? How many units of \(X\) would the firm sell and how much profit would this monopoly make?

4. \(\Delta WL=-6892\frac{2}{3}\) Calculate the dead weight loss caused by this short run monopoly.

F. Short Essay (20 pts) Choose \textbf{ONLY ONE (1)} of the following topics for a short (maximum 250 words) essay. Clearly labelled and explained diagrams will definitely help your essay.

1. What happens to the elasticity of demand as time passes? (Is a short run demand curve more or less elastic than a long run demand curve?) Given this, will a minimum wage law do more damage in the short run or the long run? Explain.

2. According to the November 26th, 2016 issue of the ECONOMIST, batteries for electric cars are still far too expensive to be competitive with gasoline fuelled cars. Currently, a battery costs $325 per kilowatt hour. If battery costs fell to $125 per kilowatt hour (the 2020 target set by the US Department of Energy), then electric cars would be competitive if oil cost $115 per barrel. (Current oil prices are around $50 per barrel) Under BC's "Clean Energy Vehicle Program", BC residents and businesses are eligible for a subsidy from the government of $5000 (and up to $8250) if they buy an electric car. Do you think this is a good use of government money? Why or why not?