Name:  

UIN:  

Class time: (please circle)  

11:10am to 12:25pm  or  12:45pm to 2:00pm

Instructions:

1. Please provide your name and UIN.

2. Circle the correct class time.

3. To get full credit on answers for this exam, be clear, rigorous, and thorough in your responses.

4. You cannot get credit (full or partial) unless something is written.

5. Sign the Aggie Pledge.

"On my honor, as an Aggie, I have neither given nor received unauthorized aid on this academic work."

Signature ___________________________  Date ___________________________
Question 1. Basic Concepts (20 points)

(2pts) (a) Solve for x and y. Show all work.

\[
\begin{align*}
2x + 3y &= 2 \\
x - y &= -4 \\
-8 + 5y &= 2 \\
5y &= 10 \\
y &= 2 \\
x &= -2
\end{align*}
\]

(b) Information concerning the financial situation for the Frito Lay Company in 2012 is given as follows:

<table>
<thead>
<tr>
<th>Sales Revenue ($ million)</th>
<th>Net Income ($ million)</th>
<th>Net Worth ($ million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15,213</td>
<td>4,879</td>
<td>11,086</td>
</tr>
</tbody>
</table>

(1pt) (i) Calculate the profit margin for the Frito Lay Company.

\[
\text{Profit margin} = \frac{\$4,879 \text{ million}}{\$15,213 \text{ million}} \times 100 \approx 32.07 \%
\]

(2pts) (ii) Calculate the return on equity for the Frito Lay Company. Interpret this answer.

\[
\text{Return on Equity (ROE)} = \frac{\$4,879 \text{ million}}{\$11,086 \text{ million}} \times 100 \approx 44.01 \%
\]

(2pts) (c) True or False.

Suppose that a demand curve is expressed as Q = 10 - 15P. The own-price elasticity along this linear demand curve is constant. Provide evidence to support your answer.

\[
\text{Elasticity} = \frac{\text{dQ}}{\text{dP}} \times \frac{P}{Q} = \frac{-15P}{10 - 15P} \neq \text{constant}
\]

(1pt) (d) What is the technical name of the situation where all possible outcomes of managerial decisions and their probabilities are completely known?

Uncertainty

(1pt) (e) The sum of all probabilities in the context of any managerial decision must equal __1__.

(1pt) (f) A certainty equivalent factor α > 1 implies what type of risk attitude?

Risk-taking or risk-seeking or risk-loving
(g) The expected value in dollar terms of a risky project is $200,000. The certainty equivalent factor is $a = 0.6$.

(2pts) (i) What is the certainty equivalent of this project? \( CE = a \cdot EV = 0.6 \cdot 200,000 = $120,000 \)

(ii) To what type of risk attitude does this situation correspond? Since $a < 1$, risk-averse.

(iii) Suppose that $a = 1$. To what type of risk attitude does this situation correspond? risk neutrality or indifference to risk.

(2pts) (h) Suppose an individual's utility function is related to income. Denote this utility as $U(y)$. It is known that $U(75) = 5$, $U(125) = 10$, and $U(175) = 18$. To what type of risk attitude does this situation correspond? Show all work.

so as income $\uparrow$, $MU$ $\uparrow$

so as income $\uparrow$, $MU$ $\uparrow$

(i) If a decision-maker is indifferent to risk, then the risk premium is 0.

(1pt) True or False. The notions of business profit and economic profit are not indistinguishable.

(1pt) (k) The economist associated with the topic of risk analysis is FRANK KNIGHT.

(1pt) (l) Name the economist who is responsible for the use of elasticities. ALFRED MARSHALL.

Question 2. (8 points)

Suppose that you gain employment with Cheddars Restaurants as a research analyst. You note that historically Cheddars sells 2,000 salads at its location in the Bryan/College Station area when the price per salad is $15. You also realized that the own-price elasticity for these salads is -1.2.

(2pts) (a) Is this own-price elasticity a reasonable estimate of behavior of Cheddars patrons? Why or why not? yes $\rightarrow$ availability of many substitutes

(3pts) (b) Suppose that management wishes to lower the price of salads to $12. Provide a prediction of the number of salads that will be sold at this price. Show all work. $\% \Delta q = 24\%$, $\% \Delta p = -20\%$, $\% \Delta q = -1.2$

(1pt) (c) Will this action, all other factors invariant, result in a rise or fall in sales revenue? An increase in sales revenue due to the demand for Cheddars' salads assuming the own-price elasticity is correct.

(2pts) (d) What is the magnitude of the gain or loss in revenue? initial revenue 2,000 * $15 = $30,000 new revenue 2,450 * $12 = $29,460 loss of $40
Question 3. (5 points)

(2pts)  (a) Suppose that for BEGIN, Inc. you find that \( AVC = 17 - 0.5Q + 0.05Q^2 \). What is the shutdown price for BEGIN, Inc.?

\[
\text{The shutdown price corresponds to the minimum point on the AVC curve.}
\]

\[
\begin{align*}
\text{Find minimum of AVC} \\
-0.05Q + 10 & = 0 \\
\Rightarrow Q & = 5
\end{align*}
\]

\[
\begin{align*}
\text{Set } S& = 0 \\
\Rightarrow 1 & > 0 \\
\text{guarantees a minimum}
\end{align*}
\]

When \( Q = 5 \), \( AVC = 17 - \frac{2.5}{2} + \frac{25}{2} = \frac{18.25}{2} = 9.125 \approx 9.13 \)

(b) The total cost function for Ambruse Brothers, Inc. is given by \( TC = 100 + 12Q + 0.1Q^2 \).

(1pt)  (i) What is the marginal cost function?

\[
MC = 12 + 2Q
\]

(2pts)  (ii) Suppose that the firm finds that the additional revenue generated as a result of producing one more unit of output equals $16. Given this information, what is the optimal level of output for profit maximization? Show all work.

\[
MR = \frac{\$16}{1} = \frac{\$12 + 2Q}{1}
\]

\[
\Rightarrow 4 = 2Q
\]

\[
Q = 20
\]

Question 4. (4 points)

(2pts)  (a) Suppose that the Amrico Financial Services, Inc. anticipated that profits over the next two years to be as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>Expected Profits (Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>$12,000</td>
</tr>
<tr>
<td>2014</td>
<td>$15,000</td>
</tr>
</tbody>
</table>

Assuming the discount rate to be two percent, calculate value of Amrico Financial Services, Inc. today.

\[
\text{Value of the Firm} = \frac{12,000}{1.02} + \frac{15,000}{(1.02)^2} = \$26,182.24
\]

(1pt)  (b) The discount rate is a measure of __Opportunity Cost__.

(1pt)  (c) Name another factor besides the discount rate which could affect the value of this firm.

\[
\text{Time Horizon} \quad \text{Magnitude of Expected Profits in Future Years.}
\]
Question 5. (10 points)

Suppose that Atlantis, Inc., a manufacturer of microcomputer chips, faces demand and cost equations given by \( Q = 8.5 - 0.05P \) and \( TC = 100 + 38Q \). \( Q \) corresponds to the number of lots of computer chips produced and \( P \) corresponds to the price per lot.

(2pts) (a) Derive the inverse demand function.

\[
Q = 8.5 - 0.05P \\
0.05P = 8.5 - Q \\
P = 170 - 20Q
\]

(1pt) (b) Derive the revenue function. Express your answer in terms of \( Q \).

\[
TR(q) = PQ = 170Q - 20Q^2
\]

(2pts) (c) Derive the profit function. Express your answer in terms of \( Q \).

\[
\pi(q) = TR(q) - TC(q) = 170q - 20q^2 - 100 - 38q \\
\pi(q) = -100 + 132q - 20q^2
\]

(3pts) (d) What value of \( Q \) maximizes profit for Atlantis, Inc.? Provide both first-order and second-order conditions to substantiate your answer.

\[
FC: \frac{d\pi(q)}{dq} = 132 - 40q = 0 \\
Q = 3.3 \\
SOC: \frac{d^2\pi(q)}{dq^2} = -40 < 0 \text{ maximizes }
\]

(1pt) (e) What price should Atlantis, Inc. charge for a particular lot of computer chips to assure profit maximization?

\[
P = 170 - 20Q = 170 - 20(3.3) = 170 - 66 = \$104
\]

(1pt) (f) What is the maximum level of profit Atlantis, Inc. may earn?

\[
\max \pi = -100 + 132q - 20q^2 \\
\max \pi = -100 + 132(3.3) - 20(3.3)^2 \\
\max \pi = -100 + 435.6 - 217.8 \\
\max \pi = 117.80
\]
Question 6. (8 points)

Suppose that the demand and supply curves for a particular commodity are given as follows:

\[ Q_d = 80,000 - 4,000P, \text{ and} \]
\[ Q_s = -18,000 + 10,000P. \]

\( Q_d \) refers to the quantity demanded, \( Q_s \) refers to the quantity supplied, and \( P \) corresponds to the price.

(2pts) (a) Find the market equilibrium price (P) and quantity (Q).

\[
\begin{align*}
Q_d &= Q_s \\
80,000 - 4,000P &= -18,000 + 10,000P \\
98,000 &= 14,000P \\
P &= 7 \\
\text{when } P = 7, \ Q_d = Q_s = 52,000
\end{align*}
\]

(4pts) (b) What is the elasticity of demand and supply at market equilibrium?

\[
\begin{align*}
E_d &= \frac{-4,000P}{\phi} = \frac{-4,000(7)}{52,000} = -0.5385 \\
E_s &= \frac{10,000P}{\phi} = \frac{10,000(7)}{52,000} = 1.3462
\end{align*}
\]

(1pt) (c) When \( P = 6 \), does a surplus or shortage exist?

\[
\begin{align*}
P &= \$6 \\
Q_d &= 56,000 \\
Q_s &= 42,000
\end{align*}
\]

\( Q_d > Q_s \)

(1pt) (d) What is the magnitude of the surplus or shortage?

\[ 14,000 \]
Question 7. (11 points)

Suppose that the demand function for Yoplait yogurt is given by the following:

\[ Q_{\text{Yoplait}} = 5P_{\text{Yoplait}}^{-1.5} P_{\text{Dannon}}^{0.8} P_{\text{Horizon Organic}}^{0.4} I^{0.3} A^{0.1}, \]

where \( Q_{\text{Yoplait}} \) is the quantity demanded of Yoplait yogurt; \( P_{\text{Dannon}} \) is the price of Dannon yogurt; \( P_{\text{Horizon Organic}} \) is the price of Horizon Organic yogurt, and \( I \) is consumer income. \( A \) corresponds to advertising expenditures for Yoplait yogurt.

In (a) – (g), indicate whether each of the following statements is true or false, and provide explanations.

(1pt) (a) An 8 percent increase in the price of Yoplait yogurt, all other factors held constant, yields a 12 percent decrease in the quantity demanded of Yoplait yogurt.

\[ \frac{\% \Delta Q}{\% \Delta P} = -12 \quad \text{and} \quad \frac{-12}{8} = -1.5 \quad \text{TRUE} \]

(1pt) (b) A price reduction for Yoplait yogurt will increase both the number of units sold and sales revenue.

\[ \text{TRUE - elastic demand for product} \]

(1pt) (c) Dannon and Horizon Organic brands are substitutes for Yoplait yogurt.

\[ \text{TRUE - both cross-price elasticities are positive} \]

(1pt) (d) Horizon Organic yogurt is the principal competitor to Yoplait yogurt.

\[ \text{FALSE - Dannon is the principal competitor to Yoplait} \]

(2pts) (e) If the price of Dannon yogurt increases by 5 percent, all other factors held constant, the quantity demanded of Yoplait yogurt increases by 8 percent.

\[ \text{FALSE - cross-price elasticity} \quad \frac{\% \Delta Q}{\% \Delta P} = .8 \]

(1pt) (f) Yoplait yogurt is a necessity.

\[ \text{TRUE - income elasticity} < 1 \]

(2pts) (g) To offset a 1 percent increase in the price of Yoplait yogurt, a 10 percent increase in advertising expenditures is required, holding all other factors constant.

\[ \text{FALSE - a 1% increase in the price of Yoplait yogurt generates a 1.5% decrease in the quantity demanded. Need to offset this with 15% increase in advertising expenditure} \]

(1pt) (h) What is the technical name of this type of demand function?

\[ \frac{\% Q}{\% A} = .1 \quad \text{and} \quad \frac{\% Q}{\% A} = \frac{.8}{1} \to \text{Multiplicative} \]

(1pt) (i) List one additional factor which may affect the demand for Yoplait yogurt.

\[ \text{Seasonality, other yogurt prices} \]
Question 8. (12 points)

Fish Daddy’s is a chain of seafood restaurants. The company has a limited amount of capital for expansion and must carefully weigh available alternatives. Currently, the company is considering opening restaurants in Baltimore, Maryland or Sacramento, California. Projections for these two potential outlets under two possible scenarios (pessimistic or optimistic), their contributions to profit and their respective probabilities are given as follows:

<table>
<thead>
<tr>
<th>City</th>
<th>Scenario (State of Nature)</th>
<th>Annual Profit ($\pi$)</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baltimore</td>
<td>Pessimistic</td>
<td>$10,000</td>
<td>0.4</td>
</tr>
<tr>
<td>Baltimore</td>
<td>Optimistic</td>
<td>$20,000</td>
<td>0.6</td>
</tr>
<tr>
<td>Sacramento</td>
<td>Pessimistic</td>
<td>$8,000</td>
<td>0.7</td>
</tr>
<tr>
<td>Sacramento</td>
<td>Optimistic</td>
<td>$30,000</td>
<td>0.3</td>
</tr>
</tbody>
</table>

(a) Calculate the expected value, standard deviation, and coefficient of variation for the annual contribution to profit for each city location. Specify the choice of location given this information based on these criteria. Show all work.

(4pts) Expected Value:

\[
E_{V_B} = (\$10,000)(0.4) + (\$20,000)(0.6) = \$4,000 + \$12,000 = \$16,000 \\
E_{V_S} = (\$8,000)(0.7) + (\$30,000)(0.3) = \$5,600 + \$9,000 = \$14,600
\]

Since \( E_{V_B} > E_{V_S} \) choose Baltimore.

(4pts) Standard Deviation:

\[
\sigma^2_B = (\$10,000 - \$16,000)^2(0.4) + (\$20,000 - \$16,000)^2(0.6) = 24,000,000 \\
\sigma_B = \$4,898.9795
\]

\[
\sigma^2_S = (\$8,000 - \$14,600)^2(0.7) + (\$30,000 - \$14,600)^2(0.3) = 101,640,000 \\
\sigma_S = \$10,081.6665 \\
\text{Since } \sigma_B < \sigma_S \text{ choose Baltimore.}
\]

(2pts) Coefficient of Variation:

\[
CV_B = \frac{\$4,898.9795}{\$16,000} = 0.3062
\]

\[
CV_S = \frac{\$10,081.6665}{\$14,600} = 0.6905
\]

Since \( CV_B < CV_S \) choose Baltimore.

(1pt) (b) Standard deviation is a measure of absolute risk.

(1pt) (c) Coefficient of variation is a measure of relative risk.
Question 9. (12 points)

The Kellogg Company considers profit scenarios for the next fiscal year.

<table>
<thead>
<tr>
<th>Business Conditions</th>
<th>Profit</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>$400,000</td>
<td>0.2</td>
</tr>
<tr>
<td>Conventional (Typical)</td>
<td>$200,000</td>
<td>0.7</td>
</tr>
<tr>
<td>Abysmal</td>
<td>$50,000</td>
<td>0.1</td>
</tr>
</tbody>
</table>

(a) Calculate the expected value of profit for the Kellogg Company for the next fiscal year.

\[
E V_\pi = \left( \$400,000 \right) (0.2) + \left( \$200,000 \right) (0.7) + \left( \$50,000 \right) (0.1) \\
E V_\pi = \$80,000 + \$140,000 + \$5,000 = \$225,000
\]

(b) Suppose the utility function for the CFO (Chief Financial Officer) is given by \( U = \sqrt{\pi} \), where \( \pi \) corresponds to profit.

(i) Calculate the MU of profit for this decision-maker.

\[
MU_\pi = \frac{1}{2\sqrt{\pi}}
\]

(ii) Is the CFO a risk taker, risk averter, or neutral to risk?

\( \pi \uparrow \rightarrow MU_\pi \downarrow \)

(iii) If \( U = 8\pi^2 + 2\pi \), is the CFO a risk taker, risk averter, or neutral to risk?

\[MU_\pi = \frac{16\pi + 2}{16\pi^2} + 2 \]

\( \pi \uparrow \rightarrow MU \uparrow \)

(c) Calculate expected utility for the CFO when \( U = \sqrt{\pi} \). Show all work.

\[
\text{Expected utility} = \sqrt{\$400,000 \left(0.2\right)} + \sqrt{\$200,000 \left(0.7\right)} + \sqrt{\$50,000 \left(0.1\right)}
\]

\[
\text{Expected utility} = 632.4555 + 447.2156 + 223.6068 = 126.4911 + 313.0495 + 22.3607
\]

\[
\text{Expected utility} = 461.9013
\]

(d) What is the risk premium when \( U = \sqrt{\pi} \). Show all work.

\[
\text{Risk premium} = EV_\pi - \pi^* = \$225,000 - \$213,352.81 = \$11,647.19
\]

\[
\sqrt{\pi^*} = 461.9013 \Rightarrow \pi^* = 213,352.81
\]

(e) Suppose that for this CFO, your calculation of the risk premium is negative. Then what would you conclude about the CFO’s attitude toward risk?

CFO is a risk seeker or a risk taker

risk loving
Question 10. (10 points)

Suppose two projects offer the following payoff matrix:

<table>
<thead>
<tr>
<th>State of Economy</th>
<th>Project A</th>
<th>Project B</th>
<th>Probability of the State of the Economy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recession</td>
<td>$13,000</td>
<td>$14,000</td>
<td>0.1</td>
</tr>
<tr>
<td>Normal</td>
<td>$16,000</td>
<td>$15,000</td>
<td>0.7</td>
</tr>
<tr>
<td>Boom</td>
<td>$18,000</td>
<td>$16,000</td>
<td>0.2</td>
</tr>
</tbody>
</table>

\( \max \text{ payoff} \)

\( \$14,000 \)

\( \$16,000 \)

\( \$18,000 \)

(3pts)  
(a) What project should be undertaken if a maximum decision rule is used?

\[ \text{best of worst possible outcomes} \]

\[ \text{for Project A worst outcome is } \$13,000 \]

\[ \text{for Project B worst outcome is } \$14,000 \]

\( \therefore \) if a maximum decision rule is used

\[ \text{choose Project B} \]

(6pts)  
(b) What project should be undertaken if a minimax regret decision rule is used? Your answer must provide the opportunity loss or regret matrix.

\[ \text{opportunity loss or regret matrix} \]

\[
\begin{array}{cc}
\text{Recession} & \text{Project A} & \text{Project B} \\
\$1,000 & \$0 & \\
\text{Normal} & \$0 & \$1,000 \\
\text{Boom} & \$0 & \$2,000 \\
\end{array}
\]

\( \text{max loss} \)

\( \$1,000 \)

\( \$2,000 \)

\( \text{choose Project A} \)

(1pt)  
(c) Would your answer to (a) or (b) change if the probabilities associated with the state of the economy were to change to 0.2 (recession), 0.5 (normal), and 0.3 (boom) respectively?

\[ \text{No}, \text{ the maximum decision rule and the minimax regret decision rule are not dependent on probabilities of the state of the economy.} \]