§ I. TRUE AND / OR FALSE. Circle your answer. There are 4 questions at 2 points each.

1. TRUE or FALSE: An amortization table can be used to compare equilibrium of demand.

2. TRUE or FALSE: The maximum profit is always given where the marginal revenue is the largest.

3. TRUE or FALSE: There is no function \( f(x) \) for which the derivative \( f'(x) \) is equal to the antiderivative \( \int f(x) \, dx \).

4. TRUE or FALSE: A definite integral is the slope of the tangent line.

§II. MULTIPLE CHOICE. Circle your answer. There are 4 question at 5 points.

1. An employee is paid $12.00 per hour plus time-and-a-half for overtime (over 8 hours). The function \( W(x) \) that gives amount of pay for \( x \) hours is \( W(x) = \)

   a. \( \begin{cases} 12x & 0 \leq x \leq 8 \\ 18x & 8 < x \leq 24 \end{cases} \)
   b. \( \begin{cases} 12 & 0 \leq x \leq 8 \\ 18 & 8 < x \leq 24 \end{cases} \)
   c. \( \begin{cases} 12x & 0 \leq x \leq 8 \\ 96 + 18(x - 8) & 8 < x \leq 24 \end{cases} \)
   d. none of these.

2. The derivative of \( e^{-x^2/2} \)

   a. \( -x e^{-x^2/2} \)
   b. \( -x e^{(-x)} \)
   c. \( e^{(-x)} \)
   d. 0
   e. none of these.

3. The antiderivative of \( \int z(z^2 - 3)^5 \, dz \)

   a. \( \frac{u^6}{12} + k \)
   b. \( \frac{1}{12}(z^2 - 3)^6 + k \)
   c. \( \frac{z^2}{2} \times \left(\frac{z^2 - 3}{6}\right)^6 + k \)
   d. none of these.

4. The definite integral \( \int_{-2}^{4} x^3 \, dx \) equals

   a. –32
   b. –8
   c. 0
   d. +8
   e. +32
§ III. PROBLEMS. You must show your work to receive credit. There are 10 problems at 10 points each.

1. Calculate the value of the definite integral \[ \int_{0}^{1} 50 t^3 e^{-\frac{1}{2}t^2} \, dt. \]

2. Given the data for supply and demand at the right, find the MARKET EQUILIBRIUM point.

<table>
<thead>
<tr>
<th>Units q</th>
<th>Supply p</th>
<th>Demand p</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>$2.10</td>
<td>$4.00</td>
</tr>
<tr>
<td>150</td>
<td>$2.50</td>
<td>$3.50</td>
</tr>
</tbody>
</table>

3. If marginal revenue at \( q \) is $15.99, marginal cost at \( q \) is $10.50, and fixed costs are $1,050. What quantity is the BREAK EVEN POINT.
4. Suppose that average cost is $\bar{C}(q) = 0.1q + 5 + \frac{8}{q}$ and revenue is $R(q) = -0.2q^2 + 15q$.
   a. Find the point of maximum profit if maximum production is 15 units.
   
   b. Suppose a second unit is added to boost maximum possible production to 20 units. Find the new point of maximum profit.

5. In 1977, I bought a 320 acre farm for $100,000 and financed the purchase with quarterly payments over 10 years at 5% APR.
   a. What were my quarterly payments?
   b. What was the total amount I paid?
   c. What was the total interest I paid?
6. Given the data for the function $h(x)$ and that $h(3) = 1$, sketch a graph of the function.

<table>
<thead>
<tr>
<th>$x$</th>
<th>2</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>$h'(x)$</td>
<td>3</td>
<td>-0.5</td>
</tr>
</tbody>
</table>

7. Write the limit definition of the derivative of $f(x)$.

8. If fixed costs are $700 and marginal cost at $q$ is given by $\frac{600}{\sqrt{q+1}}$, find the cost function $C(q)$. 
9. Suppose shoe size is normally distributed with a mean of 10 and a standard deviation of 2. How many shoes of size $8\frac{1}{2}$ should be ordered if the total order size is 10,000 shoes?

10. Wombat harnesses list at 95¢ each, but your supplier just announced a 5% discount on orders of 14,000 or more harnesses. The ordering cost is $25 per order. You’ve estimated that average storage cost is $0.75 per harness and that you'll sell 200,000 harnesses next year.
   a. Graph $EOQ(x)$.
   b. Determine the Economic Order Quantity.