Mathematical Cost Functions

\[ C = 10 + 20q + 4q^2 \]

A Tabular Solution

\[ C = 10 + 20q + 4q^2 \]
- Compute TC, AC, and MC when \( q = 10 \)
- Find where \( MC = AC \)
- What level of output minimizes \( AC \)?
- When is \( MC = 60 \)?
### Mathematical Cost Functions - A Tabular Solution

<table>
<thead>
<tr>
<th>Q</th>
<th>C</th>
<th>AC</th>
<th>MC</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10 NA NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>34 34.0 24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>66 33.0 32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>106 35.3 40</td>
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<tr>
<td>4</td>
<td>154 38.5 48</td>
<td></td>
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<tr>
<td>5</td>
<td>210 42.0 56</td>
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<tr>
<td>6</td>
<td>274 45.7 64</td>
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<td>7</td>
<td>346 49.4 72</td>
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<tr>
<td>8</td>
<td>426 53.3 80</td>
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<tr>
<td>9</td>
<td>514 57.1 88</td>
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<tr>
<td>10</td>
<td>610 61.0 96</td>
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</tr>
</tbody>
</table>

AC(3) = \frac{106}{3} = 35.3

### Mathematical Cost Functions - A Second Problem

\[ C = 5 + 10q^2 \]

- Compute TC, AC and MC when q = 10
- Find the value of q where MC = AC
- What level of q minimizes AC
- When is MC = 60?
A Second Problem

\[ C = 5 + 10q^2 \]

- Compute TC, AC and MC when \( q = 10 \)
  
  \[ TC = 1005; \ AC = 100.5; \ MC = 200 \]

- Find where MC = AC. \( q = 0.707 \)

- What level of q minimizes AC? \( q = 0.707 \)

- When is MC = 60? \( q = 3 \)

Fixed and Variable Cost

- We divide the firm’s costs into fixed and variable components.

- Fixed costs, FC, are those the firm would incur if it had no output; \( FC = C(0) \).

- Variable costs are those that vary with output. \( VC = C(q) - FC \)

The answers are based on the equations.
You should also solve the problem using the table.
Fixed and Variable Cost

- MC cuts ATC and AVC at their minima; minimum of ATC later than min of AVC
- AVC ≠ MC
- AVC < ATC

One last Problem

\[ C = 10 + 20q + 4q^2. \]
One last Problem

\[ C = 10 + 20q + 4q^2. \]

\[ FC = 10 \]
\[ VC = 20q + 4q^2 \]
\[ AFC = \frac{10}{q} \]
\[ AVC = 20 + 4q \]