Math 3260 Practice - Least Squares

Names:

(1) A company produces widgets and records the following observed data relating $x$, the number of widgets sold (in hundreds of units), to the revenue $y$ (in $1000$s).

<table>
<thead>
<tr>
<th>$x$</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y$</td>
<td>1.8</td>
<td>2.7</td>
<td>3.4</td>
<td>3.8</td>
<td>3.7</td>
</tr>
</tbody>
</table>

It is common that the number of units offered affects the price that consumers are willing to pay for an item. The company expects that the relationship between $x$ and $y$ is essentially quadratic, that is

$$y = cx + ax^2$$

for some numbers $a$ and $c$.

(a) Set up and solve the least squares problem\(^1\) to find the quadratic that best fits the given data. Keep five digits to the right of the decimal.

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\(^1\)Recall that the normal equations will look like $A^TAx = A^Tb$. 
(b) What does your model (quadratic) predict as the revenue if 600 units are sold?

(c) Use your quadratic model to make a recommendation about the optimal number of widgets the company should make available for sale.