Problem 1. Let $P(t)$ represent the assessed value of a house $t$ years after January 1, 2000, in thousands of dollars:

<table>
<thead>
<tr>
<th>$t$</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P(t)$</td>
<td>120</td>
<td>130</td>
<td>150</td>
<td>190</td>
<td>260</td>
<td>300</td>
<td>320</td>
<td>300</td>
<td>230</td>
<td>220</td>
<td>230</td>
<td>260</td>
</tr>
</tbody>
</table>

(a) Estimate $P'(2)$; show your calculation. Write a complete sentence, without any math jargon, interpreting this value.

(b) If housing prices had continued to rise at the same rate as in 2002, what would the price of the house have been in 2005? (Use your estimate from (a).)

(c) From the data in the table, over what interval(s) does $P(t)$ appear to be concave up?

(d) Sketch an approximate graph of $P'(t)$, labeling the axes.

Problem 2. Let $T(x)$ denote the annual property taxes on the house from Problem 1 in dollars/year, where $x$ is the house’s assessed value in thousands of dollars.

(a) What does $T(P(t))$ represent?

(b) Interpret these equations in words:

$$T(260) = 2470, \quad T'(260) = 9.5.$$

(c) Use numerical data from Problem 1 and this problem to estimate the tax levied on the house in (i) 2005, (ii) 2010.

Problem 3. My friend Ginger used to work for Google. As part of her compensation, she received shares in Google’s stock. Both the number of shares in Ginger’s portfolio and the value of the shares changed over time, so we represent these quantities by functions:

- $f(t)$ is the number of shares Ginger owned $t$ weeks after Google’s initial public offering in August 2004.
- $g(t)$ is the stock price (= value per share) in dollars at time $t$, where $t$ is measured as above.

(a) Interpret the following information in words:

$$f(52) = 45, \quad f'(52) = 1, \quad g(52) = 150, \quad g'(52) = 2.$$

(b) Let $V(t)$ be a new function defined by $V(t) = f(t)g(t)$. What does $V(52)$ represent? What is its value (numerically)?

(c) What does $V'(52)$ represent?

(d) At time $t = 52$, how fast was Ginger’s wealth in stocks increasing per week? (Use the data from part (a), and keep in mind that Ginger’s wealth was increasing in two different ways: through the increase in value of her existing stock, and through the acquisition of new shares.)