1. The following table shows a manufacturer's total cost (in thousands of dollars) to produce from 1 to 14 forklift trucks. Show work and give units for each answer. Round off answers to 3 decimal places.

<table>
<thead>
<tr>
<th># of forklift trucks produced</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>10</th>
<th>12</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total cost (thousands of dollars)</td>
<td>2.0</td>
<td>4.5</td>
<td>10.5</td>
<td>15.0</td>
<td>17.5</td>
<td>18.5</td>
<td>19.0</td>
</tr>
</tbody>
</table>

(a) (5 points) Label axes appropriately and plot the data.

(b) (5 points) According to the table, what is the percent change in cost to produce from 6 to 12 forklifts?

\[
\text{percent change} = \frac{18.5 - 10.5}{10.5} \times 100\% = 76.190\%
\]

(c) (5 points) According to the table, what is the average rate of change in cost to produce from 6 to 12 forklifts?

\[
\text{ARC} = \frac{18.5 - 10.5}{12 - 6} = 1.333 \text{ thousands of$ per forklift}
\]

(d) (3 points) Draw and label a line segment through two of the points that you plotted in part (a) whose slope is given by the answer to part (c).

(e) (5 points) Let \( x \) stand for the number of forklifts produced and let \( C(x) \) stand for the total cost to produce \( x \) forklifts. Fit a LOGISTIC MODEL to the data.

\[
y = \frac{c}{1 + a e^{-bx}} \quad a = 32.668 \quad b = 0.666 \quad c = 18.971
\]

(h) (3 points) Estimate the cost to produce 9 forklifts using the model in part (e).

\[
C(9) = Y_1(9) = 16.644 \text{ thousands of$}
\]

(g) (4 points) Use the model in part (e) to approximate the average rate of change in cost to produce from 5 to 9 forklifts.

\[
\text{ARC} = \frac{C(9) - C(5)}{9 - 5} = \frac{16.644 - 7.357}{4} = 2.322 \text{ thousands of$ per forklift}
\]
2. The following graph gives the profit of a company, in millions $, in the years after 1980:

![Graph showing profit over years]

\( x = \text{number of years since 1980} \)

(a) (2points) The average rate of change in the profit from 1990 to 1998 was:
- positive
- negative
- zero  (circle one)

(b) (2points) In 1982, the instantaneous rate of change of the profit was:
- positive
- negative
- zero  (circle one)

(c) (2points) The percentage change in profit from 1986 to 1990 was:
- positive
- negative
- zero  (circle one)

(d) (2points) In 1988, the profit was:
- positive
- negative
- zero  (circle one)

(e) (3points) Estimate and list all the \( x \) values where the instantaneous rate of change of the profit was zero. Your answer should be a list of specific values not a range of values.

\( x = 6, 17 \)

\( x \) values are any number between 5 and 7, any number between 15 and 19

(f) (2points) Estimate the profit in 1981 (give units).

\( 15 \text{ million } \)  (any number between 10 and 20)

(g) (3points) Estimate the change in profit from 1981 to 1986 (give units).

\( -20 -15 = -35 \text{ million } \)  (Estimate)

(h) (4points) Estimate the average rate of change of the profit from 1981 to 1986. Show work, and give your answer with units.

\[ \text{ARC} = \frac{-20 -15}{5} = -7 \text{ million } / \text{year} \]