7. [11 points] Gretchen has managed to synthesize an even more powerful growth stimulant, Chemical Y. She administers it to a freshly hatched mealworm, and observes the mealworm’s growth over the next few days. Let \( M(t) \) denote the mass (in grams) of the mealworm \( t \) weeks after it hatches. Gretchen makes the following measurements. You do not have to show your work for this problem.

<table>
<thead>
<tr>
<th>( t )</th>
<th>( M(t) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>18</td>
</tr>
<tr>
<td>3</td>
<td>24</td>
</tr>
<tr>
<td>5</td>
<td>32</td>
</tr>
</tbody>
</table>

a. [3 points] What type of function COULD \( M(t) \) be? Circle all that apply. If none apply, circle “none of these”.

- linear
- quadratic
- exponential
- none of these

b. [4 points] Gretchen next tests Chemical Y on a silkworm. Let \( S(t) \) be the mass (in grams) of the silkworm \( t \) weeks after it hatches. Give a practical interpretation of \( S(t) = M(t+2) \).

Solution:
When both are on Chemical Y, the mass of a silkworm is equal to the mass of a mealworm that has hatched 2 weeks earlier.

c. [4 points] Gretchen tests Chemical Y on a cockroach. The cockroach weighs \( C(t) \) grams \( t \) weeks after it hatches. Gretchen has found that \( C(t) \) has the formula \( C(t) = 2(1.3)^{t-2} \). Leave your answers in exact form.

(i) The weekly growth factor of \( C(t) \) is \( 1.3^{2.5} \).
(ii) The vertical intercept of \( C(t) \) is \( 2 \cdot 1.3^{-2} \).