2. [10 points] Below are some values of functions $f(x)$, $g(x)$, and $h(x)$.

<table>
<thead>
<tr>
<th>$x$</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>$f(x)$</td>
<td>2</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>$g(x)$</td>
<td>4</td>
<td>3</td>
<td>$b$</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>$h(x)$</td>
<td>3</td>
<td>$a$</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>$k(x)$</td>
<td>0</td>
<td>2</td>
<td>$-3$</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Additionally:

- $h(x) = f(g(x))$
- The domain of $f(x)$ is $\{0, 1, 2, 3, 4\}$.
- $k(x)$ is an even, periodic function with period 10.

a. [6 points] Find the following values, or explain why they cannot be found from the given information. Be sure to show your work or explain your reasoning.

(i) $a$
(ii) $b$
(iii) $k(18)$

**Solution:**

(i) According to the table, $a = h(1)$, which by definition is $f(g(1))$. Using the table, $g(1) = 3$, so $f(3) = 4$. Therefore, $a = 4$.

(ii) According to the table, $b = g(2)$. We need to use the other facts from the table to find this value. In particular, we know $h(2) = f(g(2)) = 3$. So $g(2)$ must be a number $b$ so that $f(b) = 3$. The only such value is 4. Therefore, $b = 4$.

(iii) Since $k(x)$ is periodic with period 10, we know that $k(18) = k(8) = k(-2)$. Further, we know $k(x)$ is even, so that $k(-2) = k(2) = -3$. Therefore, $k(18) = -3$.

b. [4 points] Find all solutions to the equation $k(f(x)) = 0$.

**Solution:** According to the table, $k(u) = 0$ when $u = 0$ or 4, so we need to find $x$-values so that $f(x) = 0$ or $f(x) = 4$. The table tells us $f(1) = 0$ and $f(2) = f(3) = 4$, so the solutions are $x = 1, 2, 3$. 