

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

x	0	1	2	3	4
$f(x)$	2	0	4	4	3
$g(x)$	4	3	b	1	1
$h(x)$	3	a	3	0	0
$k(x)$	0	2	-3	1	0

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 $f(g(1)) = f(3) = 4$. 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 $x = 1, 2$, and 3 .