1. [13 points] A formula for the function $K(x)$ and a table of values for the **odd** function $A(x)$ are shown below. **The domain of $A(x)$ is all real numbers.**

$$K(x) = x^2 - 6$$

x	1	5	10
$A(x)$	−2	−6	−10

a. [5 points] If possible, evaluate each of the following expressions. If the value does not exist, write DNE; if there is not enough information to determine it, write NEI.
No explanations needed; work shown may earn partial credit.

- If $D(x) = A(x) + K(x)$, then $D(10) =$ $A(10) + K(10) = -10 + 94 = 84$

- $A(K(1)) =$ $A(-5) = 6$ **because we know that $A(x)$ is odd.**

- $K^{-1}(-7) =$ **DNE**

Solution: This is because −7 is not in the range of $K(x)$ and *also* because $K(x)$ is not invertible.

- $A(0) =$ **0**

Solution: We know that $A(0)$ is defined and, further:

$$A(0) = -A(-0) = -A(0)$$

because $A(x)$ is odd. But this also shows that $A(0)$ is its own negative, so must be 0.

b. [8 points] For each of the following functions, decide if it is *odd*, *even*, or *neither*. Circle one answer for each part. *Show all work for full credit.*

(i) $K(x)$

ODD | **[EVEN]** | NEITHER

Solution: We want to see if $K(-x) = K(x)$ (even), $K(-x) = -K(x)$ (odd), or neither.

$$K(-x) = (-x)^2 - 6 = x^2 - 6 = K(x),$$

so $K(x)$ is even.
Alternatively, we could see that the graph of $K(x)$ is a parabola with vertex at $(0, 0)$ that's been reflected over the x-axis and then shifted down 6. So it's still symmetrical about the y-axis.

(ii) $K(x) + A(x)$

ODD | EVEN | **[NEITHER]**

Solution: We want to see if $K(-x)+A(-x)=K(x)+A(x)$ (even), $K(-x)+A(-x)=-K(x)-A(x)$(odd), or neither.
Let's test two points $x=\pm 1$:

$$K(-1)+A(-1)=-5+2=3$$

$$K(1)+A(1)=-5-2=-7$$

Our answers are neither the same, nor opposites, so the function is neither even nor odd.

(iii) $A(K(x))$

ODD [EVEN] NEITHER

Solution: Since $K(-x)=K(x)$, we have $A(K(-x))=A(K(x))$. This means $A(K(x))$ is even.

(iv) $A(x)\cdot K(x)$

[ODD] EVEN NEITHER

Solution: Because $A(x)$ is odd we know $A(-x)=-A(x)$; and because $K(x)$ is even we know $K(-x)=K(x)$. Therefore,

$$A(-x)\cdot K(-x)=-A(x)\cdot K(x)=-(A(x)\cdot K(x)),$$

showing that $A(K(x))$ is odd.