6. [8 points] The parts of this problem are unrelated.

a. [5 points] The following table gives the values of the variables x, A, B, and C:

x	-1	1	2	4
$A = a(x)$	1	-2	-4	-2
$B = b(x)$	4	3	2	-1
$C = c(x)$	1	5	7	11

(i) Given the values in the tables above, which of the following statements **could** be true? Circle all that apply.

$\boxed{A \text{ is a function of } B}$ $\qquad$ B is a function of A $\qquad$ None of these

(ii) Which of the functions could be (or are) concave down on the **entire** interval $-1 \le x \le 4$? Circle all that could be correct, and justify your answers algebraically.

Answer: $a(x)$ $\qquad$ $\boxed{b(x)}$ $\qquad$ $c(x)$ $\qquad$ none of these

Justification:

Solution: We can decide the potential concavity of these functions by looking at the average rate of change on each pair of intervals given. This gives us the following values:

interval	$[-1, 1]$	$[1, 2]$	$[2, 4]$
$A = a(x)$	$-3/2$	$-2/1 = -2$	$+1$
$B = b(x)$	$-1/2$	-1	$-3/2$
$C = c(x)$	$4/2 = 2$	$2/1$	$4/2 = 2$

Based on this information, $c(x)$ could be linear, but not concave up or down, since the average rates of change are the same on all intervals. The average rates of change of $a(x)$ decrease from the first interval to the second, but increase from the second interval to the third, indicating that it cannot be concave up or down on the entire interval either. On the other hand, we see $-1/2 > -1 > -3/2$, so $b(x)$ could be concave down on this interval, as its average rates of change are decreasing.

b. [3 points] Two lines are given by the equations $y = Kx + 5$ and $x + y = 4$, where K is some constant. For what value(s) of K, if any, will these two lines intersect at $x = 1$? Show your work or explain your reasoning.

Solution: There are a number of ways to solve this. One is to plug $x = 1$ into the second equation, giving $y = 3$. Putting both these values into the first equation gives $3 = K + 5$, meaning $K = -2$.

Answer: $K =$ -2