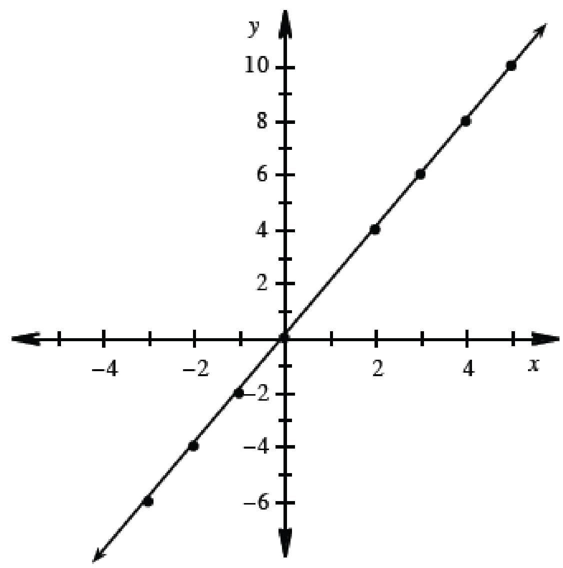
TABLES, GRAPHS, AND RULES

Example 1

Complete the table by determining the relationship between the input (x) values and output (y) values, write the rule for the relationship, then graph the data.

input (x)	4	–3		5	0		3	–2	x
output (y)	8		4	10	0	–2		–4	

Begin by examining the four pairs of input values: 4 and 8, 5 and 10, 0 and 0, –2 and –4. Determine what arithmetic operation(s) are applied to the input value of each pair to get the second value. The operation(s) applied to the first value must be the *same* in all four cases to produce each given output value. In this example, the second value in each pair is twice the first value. Since the pattern works for all four points, make the conjecture that the rule is $y(output) = 2x(input)$. This makes the missing values –3 and –6, 2 and 4, –1 and –2, 3 and 6. The rule is $y = 2x$. Finally, graph each pair of data on an xy-coordinate system, as shown at right.



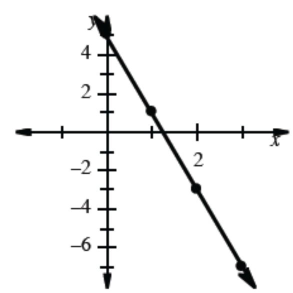
Example 2

Complete the table by determining the relationship between the input (x) and output (y) values, then write the rule for the relationship.

input (x)	2	–1	4	–3	0	–2	1	x
output (y)	3	–3	7	–7	–1	–5	1	

Use the same approach as Example 1. In this table, the relationship is more complicated than simply multiplying the input value or adding (or subtracting) a number. Use a Guess and Check approach to try different patterns. For example, the first pair of values could be found by the rule $x+1$, that is, $2+1=3$. However, that rule fails when you check it for -1 and –3: $-1+1 \neq -3$. From this guess you know that the rule must be some combination of multiplying the input value and then adding or subtracting to that product. The next guess could be to double x. Try it for the first two or three input values and see how close each result is to the known output values: for 2 and 3, $2(2)=4$; for –1 and –3, $2(-1)=-2$; and for 4 and 7, $2(4)=8$. Notice that each result is one more than the actual output value. If you subtract 1 from each product, the result is the expected output value. Make the conjecture that the rule is $y(output)=2x(input)-1$ and test it for the other input values: for –3 and –7, $2(-3)-1=-7$; for 0 and –1, $2(0)-1=-1$; for –2 and –5, $2(-2)-1=-5$; and for 1 and 1, $2(1)-1=1$. So the rule is $y=2x-1$.

Example 4



Use the graph at right to create an $x \rightarrow y$ table, then write a rule for the pattern it represents.

First transfer the coordinates of the points into an $x \rightarrow y$ table.

input (x)	0	1	2	3	x
output (y)	5	1	–3	–7	

Using the method described in Example 3, that is, noting that the growth rate between the output values is –4 and the value of y at $x=0$ is 5, the rule is: $y=-4x+5$.

Use the patterns in the tables and graphs to write rules for each relationship.

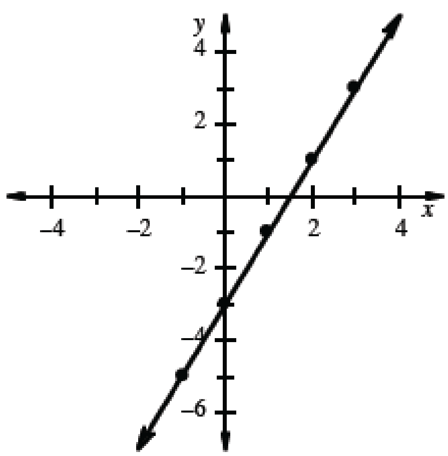
3.

input (x)	–3	–2	–1	0	1	2	3	4	5
output (y)	–11	–8	–5	–2	1	4	7	10	13

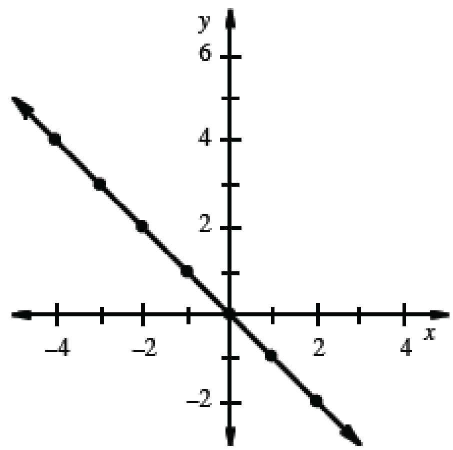
4.

input (x)	–3	–2	–1	0	1	2	3	4	5
output (y)	10	8	6	4	2	0	–2	–4	–6

5.



6.



answers on next page…

3. $y = 3x - 2$

4. $y = -2x + 4$

5. $y = 2x - 3$

6. $y = -x$