EXERCISE 5.2: Compute the output $y[n]$ for the length-4 filter whose coefficients are $\{b_k\} = \{3, -1, 2, 1\}$. Use the input signal given in Fig. 5-2. Verify that the answers tabulated here are correct, then fill in the missing values.

n	$n < 0$	0	1	2	3	4	5	6	7	8	$n > 8$
$x[n]$	0	2	4	6	4	2	0	0	0	0	0
$y[n]$	0	6	10	18	**?**	**?**	**?**	8	2	0	0

SOLUTION

$$y[n] = 3x[n] - x[n-1] + 2x[n-2] + x[n-3]$$

$$\underset{b_0}{\uparrow} \qquad \underset{b_1}{\uparrow} \qquad \underset{b_2}{\uparrow} \qquad \underset{b_3}{\uparrow}$$

$$y[2] = 3x[2] - x[1] + 2x[0] + x[-1].$$
$$= 3(6) - 4 + 2(2) + 0 = 18 \checkmark$$

$$y[3] = 3x[3] - x[2] + 2x[1] + x[0]$$
$$= 3(4) - 6 + 2(4) + 2 = \boxed{16}$$

$$y[4] = 3(2) - 4 + 2(6) + 4 = \boxed{18}$$
$$y[5] = 3(0) - 2 + 2(4) + 6 = \boxed{12}$$
$$y[6] = 3(0) - 0 + 2(2) + 4 = 8 \checkmark$$