7.6 (a) yes

(b) not causal

(c) $\sum_{n=0}^{\infty} \frac{(-1)^{(n+1)}}{n}(x[n+1]-x[n-1])$ diverges because of the n in the denominator

(d) $\delta[n]$

7.9 $\frac{1}{5}$ $\frac{2}{4}$ $\underline{3}$ (a) $\{\underline{3}, 10, 13, 10\}$

(b) $\frac{1}{6}$ $\frac{2}{5}$ $\frac{3}{\underline{4}}$ $\{\underline{4}, 13, 29, 27, 18\}$

(c) $\frac{2}{5}$ $\frac{1}{6}$ $\frac{4}{3}$ $\{\underline{6}, 15, 28, 29, 20\}$

7.10 (a) $\frac{3}{8}$ $\frac{4}{7}$ $\frac{5}{\underline{6}}$ $\{\underline{18}, 45, 82, 67, 40\}$

(b) $\frac{1}{1}$ $\frac{2}{1}$ $\frac{-3}{\underline{1}}$ $\{\underline{1}, 3\}$

(c) $\frac{3}{1}$ $\frac{4}{1}$ $\frac{5}{\underline{1}}$ $\{\underline{3}, 7, 12, 9, 5\}$

(d) $\frac{1}{2}$ $\frac{2}{0}$ $\frac{4}{\underline{0}}$ $\{\underline{0}, 0, 2, 4, 8\}$

7.12 $x[n] = \{\underline{1}, 2, 3\}$ $y[n] = \{\underline{1}, 4, 7, 6\}$

$\frac{1}{y}$ $\frac{2}{x}$ 3

$1 \cdot x = 1$ $x = 1$
$2x + y = 4$
$2y + 3x = 7$
$3y = 6$ $y = 2$

$h[n] = \{\underline{1}, 2\}$

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7.13 $h_1[n] = 3\delta[n] - 2\delta[n-1]$ $\quad h_2[n] = 5\delta[n] - 4\delta[n-1]$

$\{\underline{3}, -2\}$ $\quad \{\underline{5}, -4\}$

$$\begin{array}{cc} \underline{3} & -2 \\ -4 & \underline{5} \end{array} = \{\underline{15}, 22, 8\}$$

7.15

(a) $\sum_{n=0}^{\infty} (1+2^n) u[n] z^{-n} = \sum_{n=0}^{\infty} (1+2^n) z^{-n} = \sum_{n=0}^{\infty} z^{-n} + 2^n z^{-n} = \sum_{n=0}^{\infty} z^{-n} + \left(\frac{2}{z}\right)^n = \frac{z}{z-1} + \frac{1}{1-\frac{2}{z}} = \frac{z}{z-1} + \frac{z}{z-2}$

$= \frac{z^2 - 2z + z^2 - z}{z^2 - 3z + 2} = \boxed{\frac{2z^2 - 3z}{z^2 - 3z + 2}}$

(b) $\sum_{n=0}^{\infty} (2^n u[n] + 3^n u[n]) z^{-n} = \sum_{n=0}^{\infty} (2^n + 3^n) z^{-n} = \sum_{n=0}^{\infty} 2^n z^{-n} + 3^n z^{-n} = \sum_{n=0}^{\infty} \left(\frac{2}{z}\right)^n + \left(\frac{3}{z}\right)^n = \frac{z}{z-2} + \frac{z}{z-3}$

$= \frac{z^2 - 3z + z^2 - 2z}{z^2 - 5z + 6} = \boxed{\frac{2z^2 - 5z}{z^2 - 5z + 6}}$

(c) $\{\underline{1}, -2\} + 2^n u[n] = \delta[n] - 2\delta[n-1] + 2^n u[n] \xleftrightarrow{\mathcal{Z}} 1 - \frac{2}{z} + \frac{z}{z-2} = \frac{z^2 - 2z - 2z + 4 + z^2}{z^2 - 2z}$

$= \boxed{\frac{2z^2 - 4z + 4}{z^2 - 2z}}$

* (d) $2^{n+1} \cos(3n+4) u[n]$ $\quad \sum_{n=0}^{\infty} 2^{n+1} \cos(3n+4) z^{-n}$

$\frac{z e^{j4}}{z - 2e^{j3}} + \frac{z e^{-j4}}{z - 2e^{-j3}} = \boxed{\frac{z^2 e^{j4} - 2z e^{j} + z^2 e^{-j4} - 2z e^{-j}}{z^2 - 2z e^{-j3} - 2z e^{j3} + 4}}$

7.16 (a) $n u[n]$ $\quad \sum_{n=0}^{\infty} n u[n] z^{-n} = \sum_{n=0}^{\infty} n z^{-n} = \sum_{n=0}^{\infty} \frac{n}{z^n} = \frac{1}{(1-z)^2} = \boxed{\frac{1}{1 - 2z + z^2}}$

*

(b) $\sum_{n=0}^{\infty} (-1)^n 3^{-n} u[n] z^{-n} = \sum_{n=0}^{\infty} (-1)^n 3^{-n} z^{-n} = \sum_{n=0}^{\infty} \left(\frac{-1}{3z}\right)^n = \frac{1}{1 + \frac{1}{3z}} = \boxed{\frac{3z}{3z+1}}$

(c) $u[n] - u[n-2]$ $\quad \sum_{n=0}^{\infty} [u[n] - u[n-2]] z^{-n} = \sum_{n=0}^{2} z^{-n} = 1 + \frac{1}{z} + \frac{1}{z^2} = \boxed{\frac{z^2 + z + 1}{z^2}}$