Convolution: \( y(n) = \sum_{k=-\infty}^{\infty} h(k) x(n-k) \)

z-transform: \( X(z) = \sum_{n=-\infty}^{\infty} x(n)z^{-n} \)

1. (3 points) Calculate the convolution of \( x = [1 \ 4 \ 3 \ 2] \) with \( h = [5 \ -1 \ 3] \). Show your work.

2. (2 points) Given the difference equation \( y(n) = -0.3y(n-1) + 2x(n) \), take the z-transform of both sides of the equation. Remember, \( z^{-1} \) represents a sample delay.

3. (3 points) Solve the above equation for the transfer function \( H(z) \).

4. (2 points) Calculate the inverse z-transform of \( X(z) = \frac{z+1}{z-1} - \frac{z}{z+0.8} \) and state the values of the first non-zero samples.

\[ \begin{array}{cccc}
  k=0 & 5 & 20 & 15 & 10 \\
  k=1 & -1 & -4 & -3 & -2 \\
  k=2 & 3 & 12 & 9 & 6 \\
  y & 5 & 19 & 14 & 19 & 7 & 6 \\
\end{array} \]

\[ \begin{align*}
  &1. \quad 2 \\
  &2. \quad \frac{0.3z^{-1}y(z)}{\frac{2z}{1+0.3z^{-1}}} = \frac{2z}{z+0.3} \\
  &3. \quad \frac{y(z)}{X(z)} = \frac{2z}{1+0.3z^{-1}} = \frac{z^{-1}}{z+0.3} \\
  &4. \quad x(n) = \begin{cases} u(n) & \text{advanced by 1} \\
  u(n+1) - (-0.8)^{n-1} u(n-1) & \text{delayed by 1} \end{cases}
\end{align*} \]
Convolution: \( y(n) = \sum_{k=-\infty}^{\infty} h(k) x(n-k) \)

z-transform: \( X(z) = \sum_{n=-\infty}^{\infty} x(n) z^{-n} \)

1. (3 points) Calculate the convolution of \( x = [3 2 4] \) with \( h = [5 -3 2 1] \). \textit{Show your work.}

2. (2 points) Given the difference equation \( y(n) = 0.7 y(n-1) + 3 x(n) \), take the z-transform of both sides of the equation. Remember, \( z^{-1} \) represents a sample delay.

3. (3 points) Solve the above equation for the transfer function \( H(z) \).

4. (2 points) Calculate the inverse z-transform of \( X(z) = \frac{z^{-2} - 0.7 z^{-1}}{z-0.3} \) and state the values of the first 3 non-zero samples.