

Superposition of solutions of the KdV equation

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Nonlinear superposition via dressing

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$$\begin{array}{c}
 \begin{array}{c}
 \left[\begin{array}{cc} 1 - |\rho|^2 & -\bar{\rho} \\ \rho & 1 \end{array} \right] \\
 \text{---} \bullet \xrightarrow{\hspace{10cm}} \bullet \text{---} \\
 \text{---}L \hspace{10cm} L \text{---}
 \end{array} \\
 + \\
 \begin{array}{cc}
 \left[\begin{array}{cc} 0 & -1 \\ 1 & 0 \end{array} \right] & \left[\begin{array}{cc} 0 & -1 \\ 1 & 0 \end{array} \right] \\
 \text{---} \bullet \xrightarrow{\hspace{1cm}} \bullet \text{---} & \text{---} \bullet \xrightarrow{\hspace{1cm}} \bullet \text{---} \\
 -b_2 \hspace{0.5cm} -a_2 & -b_1 \hspace{0.5cm} -a_1
 \end{array}
 \qquad
 \begin{array}{cc}
 \left[\begin{array}{cc} 0 & -1 \\ 1 & 0 \end{array} \right] & \left[\begin{array}{cc} 0 & -1 \\ 1 & 0 \end{array} \right] \\
 \text{---} \bullet \xrightarrow{\hspace{1cm}} \bullet \text{---} & \text{---} \bullet \xrightarrow{\hspace{1cm}} \bullet \text{---} \\
 a_1 \hspace{0.5cm} b_1 & a_2 \hspace{0.5cm} b_2
 \end{array} \\
 = \\
 \begin{array}{ccccccc}
 \left[\begin{array}{cc} 0 & -1 \\ 1 & 0 \end{array} \right] & \left[\begin{array}{cc} 0 & -1 \\ 1 & 0 \end{array} \right] & \left[\begin{array}{cc} 1 - |\rho|^2 & -\bar{\rho} \\ \rho & 1 \end{array} \right] & \left[\begin{array}{cc} 0 & -1 \\ 1 & 0 \end{array} \right] & \left[\begin{array}{cc} 0 & -1 \\ 1 & 0 \end{array} \right] \\
 \text{---} \bullet \xrightarrow{\hspace{1cm}} \bullet \text{---} & \text{---} \bullet \xrightarrow{\hspace{1cm}} \bullet \text{---} & \text{---} \bullet \xrightarrow{\hspace{10cm}} \bullet \text{---} & \text{---} \bullet \xrightarrow{\hspace{1cm}} \bullet \text{---} & \text{---} \bullet \xrightarrow{\hspace{1cm}} \bullet \text{---} \\
 -b_2 \hspace{0.5cm} -a_2 & -b_1 \hspace{0.5cm} -a_1 & -L \hspace{10cm} L & a_1 \hspace{0.5cm} b_1 & a_2 \hspace{0.5cm} b_2
 \end{array}
 \end{array}$$

