In[112]:= **FGn1FDdt** = $- \dfrac{\left(k \left(3 \, g \, H + g \, H^3 \, k^2 - 3 \, U^2\right) \, w\right) \, dt^2}{2 \left(3 + H^2 \, k^2\right)}$;

$- \dfrac{dt^2 \, k \left(gH \left(3 + H^2 \, k^2\right) - 3 \, U^2\right) \, w}{2 \left(3 + H^2 \, k^2\right)}$;

FGn1FDdtRed = $-dt^2 \, k \big/ 2 \, w \left(gH - \dfrac{3 \, U^2}{\left(3 + H^2 \, k^2\right)}\right)$

FGn1FDdxdt = $-\dfrac{1}{2} \left(\sqrt{g \, H} \ k^2 \, U\right) \, dt * dx$

FGn1FDdx = 0;

Out[114]= $-\dfrac{1}{2} \, dt^2 \, k \left(gH - \dfrac{3 \, U^2}{3 + H^2 \, k^2}\right) \, w$

Out[115]= $-\dfrac{1}{2} \, dt \, dx \, \sqrt{g \, H} \ k^2 \, U$

In[117]:= **FGn2FDdt** = $- \dfrac{\left(k \left(3 \, g \, H + g \, H^3 \, k^2 - 3 \, U^2\right) \, w\right) \, dt^2}{2 \left(3 + H^2 \, k^2\right)}$;

FGn2FDdtRed = $-dt^2 \, k \big/ 2 \, w \left(gH - \dfrac{3 \, U^2}{\left(3 + H^2 \, k^2\right)}\right)$

FGn2FDdxdt = $- \dfrac{i \left(9 \, g \, H \, k^3 + 6 \, g \, H^3 \, k^5 + g \, H^5 \, k^7 + 18 \, k^3 \, U^2 + 3 \, H^2 \, k^5 \, U^2\right) \, dt}{12 \left(3 + H^2 \, k^2\right)^2} \, dx^2$;

Expand$\left[\left(3 + H^2 \, k^2\right)^2\right]$;

$- \dfrac{i \left(g \, H \, k^3 \left(3 + H^2 \, k^2\right)^2 + 18 \, k^3 \, U^2 + 3 \, H^2 \, k^5 \, U^2\right) \, dt}{12 \left(3 + H^2 \, k^2\right)^2} \, dx^2$;

$- \dfrac{i \left(g \, H \, k^3 \left(3 + H^2 \, k^2\right)^2 + k^3 \, U^2 \left(18 + 3 \, H^2 \, k^2\right)\right) \, dt}{12 \left(3 + H^2 \, k^2\right)^2} \, dx^2$;

FGn2FDdxdtRed = $- \left(i * dt * k^3 * dx^2 \big/ 12\right) * \left(gH + \dfrac{U^2 \left(18 + 3 \, H^2 \, k^2\right)}{\left(3 + H^2 \, k^2\right)^2}\right)$

FGn2FDdx = 0;

Out[118]= $-\dfrac{1}{2} \, dt^2 \, k \left(gH - \dfrac{3 \, U^2}{3 + H^2 \, k^2}\right) \, w$

Out[123]= $-\dfrac{1}{12} \, dt \, dx^2 \, i \, k^3 \left(gH + \dfrac{\left(18 + 3 \, H^2 \, k^2\right) \, U^2}{\left(3 + H^2 \, k^2\right)^2}\right)$

In[125]:= $\texttt{FGn2FEMdt} = -\dfrac{\left(k\left(3\,g\,H + g\,H^3\,k^2 - 3\,U^2\right)w\right)dt^2}{2\left(3 + H^2\,k^2\right)}$;

$-\dfrac{dt^2\,k\left(g*H*\left(3 + H^2\,k^2\right) - 3\,U^2\right)w}{2\left(3 + H^2\,k^2\right)}$;

$\texttt{FGn2FEMdtRed} = -dt^2\,k\,/\,2\,w\left(gH - \dfrac{3\,U^2}{\left(3 + H^2\,k^2\right)}\right)$

$\texttt{FGn2FEMdxdt} = -\dfrac{\mathbb{i}\left(90\,g\,H\,k^3 + 60\,g\,H^3\,k^5 + 10\,g\,H^5\,k^7 - 36\,k^3\,U^2 - 15\,H^2\,k^5\,U^2\right)dt}{120\left(3 + H^2\,k^2\right)^2}\,dx^2$;

$-\dfrac{\mathbb{i}\,dt\,dx^2\left(10\,g\,H\,k^3\left(3 + H^2\,k^2\right)^2 - k^3\,U^2\left(36 + 15\,H^2\,k^2\right)\right)}{120\left(3 + H^2\,k^2\right)^2}$;

$\texttt{FGn2FEMdxdtRed} = -\left(\mathbb{i}*dt*k\text{^}3*dx^2\,/\,12\right)*\left(gH - \dfrac{U^2\left(36 + 15\,H^2\,k^2\right)}{10\left(3 + H^2\,k^2\right)^2}\right)$

$\texttt{FGn2FEMdx} = 0$;

Out[127]= $-\dfrac{1}{2}\,dt^2\,k\left(gH - \dfrac{3\,U^2}{3 + H^2\,k^2}\right)w$

Out[130]= $-\dfrac{1}{12}\,dt\,dx^2\,\mathbb{i}\,k^3\left(gH - \dfrac{\left(36 + 15\,H^2\,k^2\right)U^2}{10\left(3 + H^2\,k^2\right)^2}\right)$

In[132]:= $\texttt{FGn3FDdt} = -\dfrac{\left(k\left(3\,g\,H + g\,H^3\,k^2 - 3\,U^2\right)w\right)dt^2}{2\left(3 + H^2\,k^2\right)}$;

$\texttt{FGn2FDdtRed} = -dt^2\,k\,/\,2\,w\left(gH - \dfrac{3\,U^2}{\left(3 + H^2\,k^2\right)}\right)$

$\texttt{FGn3FDdxdt} = -\dfrac{1}{12}\left(\sqrt{g\,H}\,k^4\,U\right)dt\,dx^3$

$\texttt{FGn3FDdx} = 0$;

Out[133]= $-\dfrac{1}{2}\,dt^2\,k\left(gH - \dfrac{3\,U^2}{3 + H^2\,k^2}\right)w$

Out[134]= $-\dfrac{1}{12}\,dt\,dx^3\,\sqrt{g\,H}\,k^4\,U$