1 Mass in Soliton

$$Mass(t) = \int_{-\infty}^{\infty} h dx$$

For the Soliton at $t = 0$

$$h(x,0) = a_0 + a_1 sech^2(\kappa x)$$
$$u(x,0) = c\left(1 - \frac{a_0}{a_0 + a_1 sech^2(\kappa x)}\right)$$

$$\kappa = \frac{\sqrt{3a_1}}{2a_0\sqrt{a_0 + a_1}} \tag{1}$$

and

$$c = \sqrt{g(a_0 + a_1)} \tag{2}$$

Integrate from x_0 to x_1

$$Mass(0) = \int_{x_0}^{x_1} a_0 + a_1 sech^2\left(\frac{\sqrt{3a_1}}{2a_0\sqrt{a_0 + a_1}}x\right) dx$$
$$Mass(0) = \int_{x_0}^{x_1} a_0\, dx + \int_{x_0}^{x_1} a_1 sech^2\left(\frac{\sqrt{3a_1}}{2a_0\sqrt{a_0 + a_1}}x\right) dx$$
$$Mass(0) = a_0(x_1 - x_0)\, dx + a_1 \int_{x_0}^{x_1} sech^2(\kappa x)\, dx$$
$$Mass(0) = a_0(x_1 - x_0)\, dx + a_1 \left[\frac{\tanh(\kappa x)}{\kappa}\right]_{x_0}^{x_1}$$