

## 2.9: The Soap Film and the Chain

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We see that the soap film profile function and the hanging chain have identical analytic form. This is not too surprising, because the potential energy of the hanging chain in simplified units is just

$$\int y ds = \int y (1 + y'^2)^{\frac{1}{2}} dx \quad (2.9.1)$$

the same as the area function for the soap film. But there's an important *physical* difference: the chain has a fixed length. The soap film is free to adjust its “length” to minimize the total area. The chain isn't—it's *constrained*. How do we deal with that?

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