The Global Enneper-Weierstrass representation for Minimal Surfaces:

$$X(\zeta) = \mathrm{Re}\int_0^{re^{i\theta}} \phi\,.$$

Where:

$$\phi = \left(1 - g^2,\ i\left(1 + g^2\right),\ 2g\right)\eta\,.$$

Enneper’s Minimal Surface:

$$g = \zeta;\ \zeta = re^{i\theta};\ \eta = 1;$$

Scherk’s Second Minimal Surface:

$$g = i\zeta;\ \eta = \frac{4}{1-\zeta^4};$$

Jorge-Meeks Trinoid:

$$g = \zeta^2;\ \eta = \left(\zeta^3 - 1\right)^{-2};$$

Costa’s Genus 1, 3-Ended Minimal Surface:

$$g = \frac{2\sqrt{2\pi}\,P(1/2)}{P'};\ \eta = P;$$

Where P is the Weierstrass Elliptic P Function.

Genus k, Three-Ended Minimal Surface (Hoffman-Meeks):

$$g = \frac{c_k}{w}\,;\ \eta = \left(\frac{\zeta}{w}\right)^k;$$

$$c_k = \sqrt{\frac{A}{B}}\ ;$$

$$A = \int_0^1 \frac{\left(t^k\left(1-t^2\right)\right)^{\frac{1}{k+1}}}{t^2-1}\,dt$$

$$B = \frac{-1}{2}\int_0^1 \left(t^k\left(1-t^2\right)\right)^{\frac{-1}{k+1}}\,dt$$

$$w = \left(\zeta^k(\zeta^2-1)\right)^{\frac{1}{k+1}}$$

$$r \overset{\frac{19}{20}}{\underset{\frac{-19}{20}}{}}\ ;\ \theta \overset{\frac{2\pi}{k}}{\underset{0}{}}\ .$$

From: David Hoffman, "The Computer-Aided Discovery of New Embedded Minimal Surfaces", *The Mathematical Intelligencer*, Volume 9, Number 3, 1987