

Collatz function:
$$c(n) = \begin{cases} 3n+1 & \text{if } n \text{ odd} \\ \frac{n}{2} & \text{if } n \text{ even} \end{cases}$$

Generalized Collatz Function:

$$f(z) = \left[1 + \cos(\pi z)\right] \frac{z}{4} + \left[1 - \cos(\pi z)\right] \frac{3z+1}{2}$$

Check for integer values:

• If z is an even integer, then $\cos(\pi z) = 1$.

$$\text{So: } f(z) = \left[1 + 1\right] \frac{z}{4} + \left[1 - 1\right] \frac{3z+1}{2} = 2 \frac{z}{4} + 0 = \frac{z}{2}$$

• If z is an odd integer, then $\cos(\pi z) = -1$.

$$\text{So: } f(z) = \left[1 - 1\right] \frac{z}{4} + \left[1 - (-1)\right] \frac{3z+1}{2} = 0 + 2 \frac{3z+1}{2} = 3z+1$$

Complex Numbers: $z = x + iy$, where $x, y \in \mathbb{R}$, $i = \sqrt{-1}$
 $i^2 = -1$

Complex Plane:

