\[ f(z) = (z-11)^2(z-4)^3 \]

We are on the principal Riemann sheet, which is cut as shown. To get \[ f(12) = 2 \], we take the positive root:

\[ f(12) = (12-11)^2(12-4)^3 = 1^2 \cdot 8^3 = 2. \]

(i) Near \( z = 11 \), set \( z = 11 + r e^{i\theta} \) and we use \( \theta \) from \(-\pi/2\) to \( \pi/2 \).

Then we have \( (z-11)^2 = (r e^{i\theta})^2 = r^2 e^{i2\theta} \).

By using \( \theta = 0 \) for large positive \( z \), we achieve the desired square root.

Similarly for \( (z-4)^3 \) we use \( z = 4 + r e^{i\theta_1} \) and use \( \theta_1 \) from \(-3\pi/2\) to \( \pi/2 \) to avoid crossing the cut given from \( z = 4 \).

Thus \( f(z) = r^{1/2} e^{i\theta/2} r^{3/2} e^{i3\theta/3} \) on the principal sheet. For real \( z \) above 11, \( \theta = 0 \) \( \Rightarrow \theta_1 = \pi, r = 3, \theta = \pi/2 \), so we get the specified value that

(ii) At \( z = 8 \), \( \theta_1 = \pi/2 \), \( \theta = \pi, r = 3 \), \( \theta = \pi/2 \), \( \Rightarrow \)

\[ f(8) = 3^{1/2} e^{i\pi/2} 4^{3/2} = 3^{1/2} 4^{3/2} i. \]
(c) At $z = 0$, $\theta_1 = -\pi$, $\theta = \pi$, $\xi = 11$, $r = 4$, $S_1$

\[ S(0) = 11 \frac{k_2}{4} \frac{1}{3} e^{i\omega t - i\omega/3} = 11 \frac{k_2}{4} \frac{1}{3} e^{i\omega/6} \]