$$\int_{\gamma_R} f = 2\pi i \sum_{k=1}^{4} \operatorname{res}_{a_k} f \cdot \operatorname{ind}_{\gamma_R}(a_k) = 2\pi i \left(\operatorname{res}_{a_1} f + \operatorname{res}_{a_2} f \right)$$

$$\operatorname{res}_{a_1} f = \frac{g(a_1)}{(a_1-a_2)(a_1-a_3)(a_1-a_4)} = \frac{g(a_1)}{P'(a_1)} = \frac{a_1^2}{4a_1^3} = \frac{1}{4a_1}$$

$$\operatorname{res}_{a_2} f = \frac{g(a_2)}{(a_2-a_1)(a_2-a_3)(a_2-a_4)} = \frac{g(a_2)}{P'(a_2)} = \frac{a_2^2}{4a_2^3} = \frac{1}{4a_2}$$

$$\int_{\gamma_R} f = \frac{2\pi i}{4}\left(\overline{a_1} + \overline{a_2} \right) = \frac{2\pi i}{4}\left(e^{i7\pi/4} + e^{i5\pi/4} \right) = \frac{2\pi i}{4} e^{i3\pi/2}\left(e^{i\pi/4} + e^{-i\pi/4} \right)$$

$$= -\frac{2\pi i}{4}\, i\, 2 \underbrace{\cos\frac{\pi}{4}}_{\frac{1}{\sqrt{2}}} = \frac{2\sqrt{2}\pi}{4} = \frac{\pi}{\sqrt{2}}$$

$$\gamma_R^{(1)}(t) = t,\ t \in [-R, R], \quad \int_{\gamma_R} f = \int_{-R}^{R} \frac{t^2}{t^4+1}\, dt$$

$$\gamma_R^{(2)}(t) = R e^{it},\ t \in [0, \pi]$$

$$\left| \int_{\gamma_R^{(2)}} f \right| = \left| \int_0^{\pi} iRe^{it} \frac{R^2 e^{2it}}{R^4 e^{4it} + 1}\, dt \right| \leq \int_0^{\pi} \frac{R^3}{|R^4 e^{4it} + 1|}\, dt$$

$|a+b| \geq |a| - |b|$

$$\leq \int_0^{\pi} \frac{R^3}{R^4 - 1}\, dt = \frac{\pi R^3}{R^4 - 1} \to 0,\ R \to \infty$$

$$\lim_{R\to\infty} \int_{\gamma_R} f = \int_{-\infty}^{\infty} \frac{t^2}{t^4+1}\, dt = A$$

$$\forall R > 1, \quad \int_{\gamma_R} f = \frac{\pi}{\sqrt{2}}$$

$$A = \frac{\pi}{\sqrt{2}}$$