1. Compute the following infinite sum

$$\sum_{n=-\infty}^{+\infty} \frac{1}{n^2-2n+2}$$

2. Find all values of w such that

(a) $e^w = 1+i$ (b) $w = (1+i)^{1+i}$,   (c) $\cos w = \cancel{1+i} \mapsto 2i$

    $\boxed{(c) \quad \cos w = 2i}$

3. Find the branch cut for the following functions so that they are analytic in the designated region

(a) $\sqrt{z}$, $z \in \mathbb{C} \setminus [0, +\infty)$,   (b) $\sqrt{z}$, $z \in \mathbb{C} \setminus i \cdot (-\infty, 0]$

(c) $\sqrt{z(z-1)}$, $z \in \mathbb{C} \setminus [0,1]$,   (d) $\sqrt{z(z-1)(z-2)(z-3)}$, $z \in \mathbb{C} \setminus \left([0,1] \cup [2,3]\right)$

4. Compute the following integrals

(a) $\displaystyle\int_0^{+\infty} \frac{dx}{x^{\frac{1}{3}}(1+x^2)}$ (b) $\displaystyle\int_0^{+\infty} \frac{\log x}{x^2+4} dx$

(c) $\displaystyle\int_0^{+\infty} \frac{\sqrt{x}\log x}{x^2+1} dx$ (d) $\displaystyle\int_0^{+\infty} \frac{\log x}{x^3+1} dx$

Hints for (a), (b), (c), (d). Use one of the contours