CO2013: Complex Analysis, Final, Fall 2023

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Notice:

a) Term grading policy: Exam-3 (Final) $\times 40\%$.

b) Total 115 points in this exam.

c) Exam Time: 1:00PM-3:00PM, 11 Jan., 2024.

1. (25 pts) Evaluate the following integral:

P.V.
$$\int_0^\infty \frac{x^2 dx}{(x^2+4)(x^2+1)^2}$$
.

2. (25 pts) Derive the following integration formula with two real values a and b, and a > b > 0:

P.V.
$$\int_0^\infty \frac{\sqrt[3]{x}}{(x+a)(x+b)} dx = \frac{2\pi}{\sqrt{3}} \cdot \frac{\sqrt[3]{a} - \sqrt[3]{b}}{a-b}.$$

3. (25 pts) Use residues to find the inverse Laplace transform in the following:

$$F(s) = \frac{2s - 2}{(s+1)(s^2 + 2s + 5)}.$$

4. (40 pts) Use residues to find the Fourier transform of $f(t) = \frac{t}{t^4 + 1}$.