MATH464, Sec. 0101: Transform Methods
Department of Mathematics, UMCP **Fall 2022**
Homework 2 **Posted**: Thursday, 09/08/22
Due: Thursday, 09/15/22 **IN CLASS**

Answer all questions. Make sure that you explain all your steps and justify your answers. Each problem is worth 10 points. **Total number of points: 80**

Compute the following integrals by hand (i.e., by pen and paper only, no software etc!).
Note: The use of Matlab, or any other software, is strictly NOT permitted.

9. Compute the integral
$$I = \int_0^\infty \frac{1}{x^2 + a^2}\, dx \ ,$$
where a is a fixed real parameter with $a > 0$.

10. Compute
$$I = \int_{-\infty}^\infty \frac{1}{(x^2 + a^2)(x^2 + b^2)}\, dx \ ,$$
where a and b are fixed real parameters with $a \neq b$, $a > 0$, $b > 0$.

11. Compute
$$I = \int_0^\infty \frac{1}{1 + x^3}\, dx \ .$$
Note: You may use contour integration. A good hint will be given class.

12. Compute
$$I = \int_0^\infty e^{-x} x^n\, dx \ ,$$
for fixed integer $n > 0$.

13. Compute
$$I = \int_0^\infty e^{-x} \cos(\omega x)\, dx \ ,$$
for fixed real parameter ω.

14. Compute
$$I = \int_0^\infty e^{-x} \sin(\omega x)\, dx \ ,$$
for fixed real parameter ω.

15. Compute
$$I = \int_{-\infty}^\infty e^{-|x| - i\omega x}\, dx \qquad (i^2 = -1) \ ,$$
for fixed real parameter ω.

16. Compute
$$I = \int_{-\infty}^\infty e^{-x^2 - i\omega x}\, dx \qquad (i^2 = -1) \ ,$$
for fixed real parameter ω.