Please provide complete and well-written solutions to the following exercises.

Due April 24, at the beginning of class.

Assignment 4

Exercise 1. Let $a > 0$. Verify the formula
$$\int \frac{dx}{x^2 + a} = \frac{1}{\sqrt{a}} \tan^{-1}(x/\sqrt{a}) + C.$$

Exercise 2. Evaluate the following integrals using the method of partial fractions.
$$\int \frac{dx}{x^2 + 2x}.$$
$$\int_{1/2}^{1} \frac{y+4}{y^2 + y} dy.$$
$$\int \frac{4x^2 - 21x}{(x-3)^2(2x+3)} dx.$$

Exercise 3. Compute the following integral
$$\int \frac{x dx}{(x^2 - 1)^{3/2}}.$$

Exercise 4. Compute the following integral:
$$\int \ln(x^4 - 1) dx.$$

Exercise 5. Evaluate
$$\int_0^\infty x e^{-x} dx.$$

Exercise 6. Compute
$$\int_{-1}^{1} \sqrt{|x|}\, dx.$$

Exercise 7. Compute
$$\int_{-1}^{2} \frac{1}{x^2} dx.$$

Exercise 8. Compute the following integral, or show that the integral diverges.
$$\int_0^3 \frac{dx}{(3-x)^{3/2}}.$$