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

Due October 3, at the beginning of class.

Assignment 5

Exercise 1. Evaluate
$$\int_0^\infty xe^{-x}dx.$$

Exercise 2. Compute
$$\int_{-1}^1 \sqrt{|x|}\, dx.$$

Exercise 3. Compute
$$\int_{-1}^2 \frac{1}{x^2}dx.$$

Exercise 4. Compute the following integral, or show that the integral diverges.
$$\int_0^3 \frac{dx}{(3-x)^{3/2}}.$$

Exercise 5. Compute the following integral
$$\int_3^5 (9-x^2)dx.$$
Then, approximate this integral by computing the Trapezoid rule T_N, the Midpoint rule M_N, and Simpson's rule S_N for $N=4$. Compute also the error bounds for these three integral approximations (e.g. compute $|\int_3^5 (9-x^2)dx - T_N|$ when $N=4$). Which approximation is the best?

Exercise 6. Compute the following integral
$$\int_0^4 x^3 dx.$$
Then, approximate this integral by computing the Trapezoid rule T_N, the Midpoint rule M_N, and Simpson's rule S_N for $N=4$. Compute also the error bounds for these three integral approximations. Which approximation is the best?

Exercise 7. Compute the surface area of revolution about the x-axis over the interval $[0,1]$ of the function
$$y = 2x+1.$$

Exercise 8. Compute the surface area of revolution about the x-axis over the interval $[1,2]$ of the function
$$y = \sqrt{9-x^2}$$