

Homework Set 4

DUE: OCT 16-18, 2017 (AT THE BEGINNING OF RECITATION)

1. Use a trigonometric substitution to compute the following integrals:

(a)
$$\int \frac{dx}{x^2 \sqrt{x^2 + 4}}$$

(b)
$$\int_0^{2\sqrt{2}} \frac{x^2 dx}{(16 - x^2)^{3/2}}$$

(c)
$$\int_0^{1/2} \sqrt{1 - 4x^2} dx$$

(d)
$$\int_0^2 \sqrt{16 - x^2} dx$$

2. Estimate the area under the graph of $f(x) = \frac{\sin x}{x}$ over $0 \leq x \leq \pi$ using:

(a) Trapezoidal rule with four sub-intervals;

(b) Simpson's rule with four sub-intervals.

3. Find the area of the region enclosed by the graphs of $y = \frac{1}{x+1}$ and $y = \frac{1}{x+2}$ on the interval $[0, \infty)$.

4. Compute the following integrals if they converge, or justify why they diverge:

(a)
$$\int_1^{\infty} x^{-2} e^{2x} dx$$

(b)
$$\int_1^{\infty} x^2 e^{-2x} dx$$

(c)
$$\int_0^1 \frac{dx}{(2x-1)^{1/3}}$$

(d)
$$\int_0^{\infty} \frac{3x}{x^2 + 4} dx$$

(e)
$$\int_0^1 \frac{4x dx}{(x+1)(x^2+1)}$$

(f)
$$\int_4^{\infty} \frac{dx}{x^2 - 6x + 10}$$

(g)
$$\int_0^{\pi/2} \tan \theta d\theta$$