

**Mathematics II for Engineering**  
**Assignment 1**

**Problem 1:**

Let  $f(x) = x(x-1)(x+1)$ .

a) Draw the graph of  $f(x)$ .

b) Evaluate  $\int_{-1}^0 f(x)dx$  and  $\int_0^1 f(x)dx$ .

c) Approximate  $\int_{-1}^0 f(x)dx$  by calculating the area of the triangle with vertices  $(-1,0)$ ,  $(0,0)$  &  $(-\frac{1}{2}, f(-\frac{1}{2}))$ .

**Problem 2:**

Let  $f(x) = \sin x$ .

a) Draw the graph of  $f(x)$ .

b) Evaluate  $\int_0^{\pi} \sin x dx$ .

c) Show that  $2 \leq \pi$  by comparison of areas.

**Problem 3:**

Let  $f(x) = \frac{1}{x}$ .

a) Draw the graph of  $f(x)$ .

b) For  $s \geq 1$ , evaluate  $\int_1^s \frac{1}{x} dx$ .

c) Evaluate  $\lim_{s \rightarrow \infty} \int_1^s \frac{1}{x} dx$ . Give a geometric interpretation.

d) Evaluate  $\lim_{s \rightarrow 0^+} \int_s^1 \frac{1}{x} dx$ . Give a geometric interpretation.

**Problem 4:**

Same as Problem 3 with  $f(x) = \frac{1}{x^2}$ .

**Problem 5:**

A car is accelerating with a constant acceleration of  $1 \frac{m}{s^2}$ . It is driving with  $20 \frac{m}{s}$  at  $t_0 = 0s$ . Calculate the distance covered by the car from  $t_0$  to  $t_1$ , where  $t_1 = 60s$ .