INSTRUCTIONS:

- You can bring 2 A4 sheets of notes and a calculator.
- Each question carries 20 points.

1. Compute

$$\int \frac{1}{\sqrt{3+2x-x^2}}dx$$

2. Compute

$$\int \frac{\cos x}{3+2\sin x-\cos^2 x}dx$$

3. a/ Show that

$$\int_1^2 \frac{dx}{\ln x}$$

diverges.

b/ Let $f(x)=\int_x^2 \frac{dt}{\ln t}$. Find

$$\lim_{x\to 1}\frac{f(x)}{\ln\ln x}.$$

4. Let $f(x)=|x|$ and P_n be the partition that divides $[-1,1]$ into n equal intervals. Find the formula for $U(f,P_n)-L(f,P_n)$ in terms of n.

5. Let $f(x)=\sin(\pi x)$. Find all partitions P of $[0,4]$ such that $L(f,P)=-4$ and $U(f,P)=4$.