

Books, watches, notes or cell phones are **not** allowed. The **only** calculators allowed are the Sharp EL-531**. You **must** show all your work, the correct answer is worth 1 mark the remaining marks are given for the work.

Question 1. (1 mark each) Integrate the following indefinite integrals:

a.

$$\int \frac{1}{x^{1/5}} dx$$

b.

$$\int \csc x dx$$

c.

$$\int \tan x dx$$

d.

$$\int \frac{1}{\sqrt{13-5x^2}} dx$$

Question 2. (5 marks) The graph of $y = f(x) = x + |\cos x|$ is given below:



Find an approximation of the area under $f(x)$ on the interval $[2.8, 6]$, using the right endpoint and 4 approximating rectangles. Draw the approximating rectangles. **Use the function to find the approximation and not the graph.**

Question 3. (3 marks) Determine whether the function $y = f(x)$ is a solution to the initial value problem (IVP) below. Show your work.

$$f(x) = \frac{\arctan(2 \ln x) - \frac{\pi}{2}}{\ln x}.$$

Determine whether $f(x)$ satisfies

$$y' = \arctan(2 \ln x), \quad y(\sqrt{e}) = 0,$$

for $x > 0$, $x \neq 1$.

Question 4. (4 marks) Sketch a region whose area is equal to $\lim_{n \rightarrow \infty} \sum_{i=1}^n \sqrt{1 - \left(\frac{i}{n}\right)^2} \frac{1}{n}$ and find the exact value of the area.