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

a.

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

b.

$$\int \csc x\, dx$$
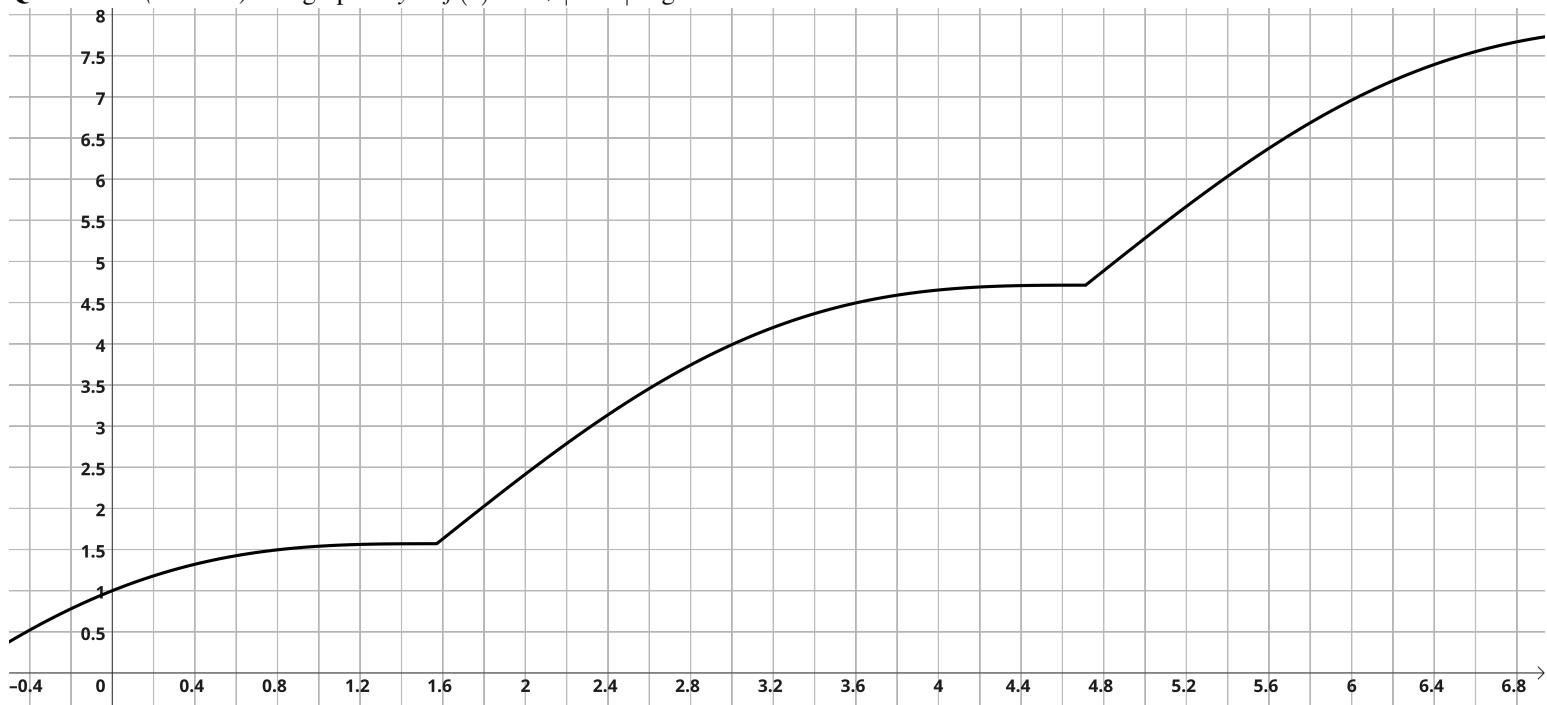
c.

$$\int \tan x\, dx$$

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

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

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

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