Provide a presentation that is both clear and organized. Show all of your work, completely simplify your answers, and give exact values only.
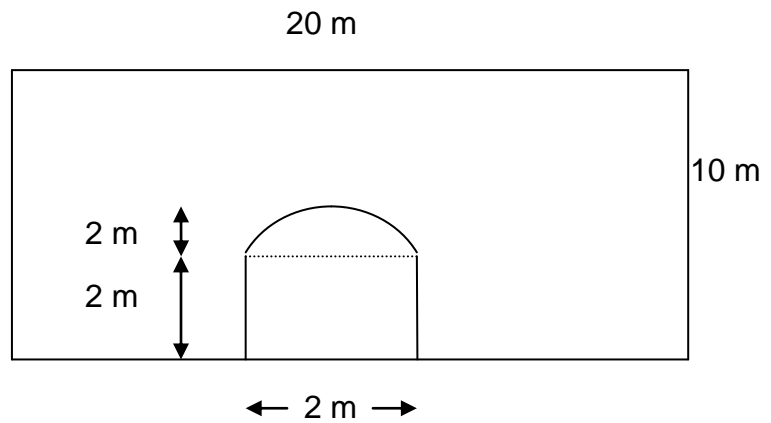
1.   (15 pts) Evaluate $\displaystyle\int \frac{2x}{x+\sqrt{x-7}}\,dx$

2. **(10 pts)** Consider the portion of the graph of $\sqrt{x} + \sqrt{y} = 1$ where $\dfrac{1}{16} \le x \le \dfrac{1}{4}$.

Determine the surface area of the surface of revolution generated by rotating this portion of the curve about the *x*-axis.

3.   (10 pts) Consider the portion of the graph of $y = \dfrac{1}{8}x^2 - \ln x$ where $1 \le x \le e$.

Determine the length of this portion of the curve.

4. (15 pts) A 10 m by 20 m concrete wall has water filled to its top as the facade of an aquarium. There is a window as depicted in the following picture that is a rectangle surmounted by one full half-cycle of a sinusoidal wave. Determine the total force due to hydrostatic pressure that this window experiences. Merely set up such an integral without evaluating.

20 m

10 m

2 m

2 m

← 2 m →

5. (10 pts) Consider $y = \cos^2 x$.

    i)   Use S_4 to approximate $\int_{-2\pi/3}^{2\pi/3} \cos^2 x\,dx$

    ii)   What value of n would allow S_n to approximate $\int_{-2\pi/3}^{2\pi/3} \cos^2 x\,dx$ accurate to within 0.00001 units?

6.   (15 pts) Evaluate $L\left[\sin(bt)\right]$ if $L\left[f\right]=\int_0^\infty e^{-st}f(t)dt$ (this is the *Laplace*

Transform of $\sin(bt)$)

7. (25 pts) Evaluate $\int \dfrac{2\sin x}{3\sin x - 2\cos x}\,dx$