

MATH 162

PRACTICE QUIZ III

1. Find a curve through the point $(e, 4)$ in the xy -plane whose arc length from $x = 1$ to $x = 7$ is given by:

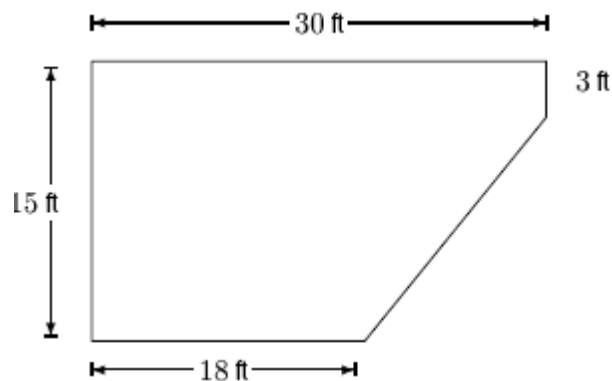
$$\int_1^7 \sqrt{1 + \frac{(\ln x)^2}{x^2}} dx$$

2. Charlotte, the spider, lives on the xy -plane. At time t (minutes), she is located at $x(t) = \cos t$ and $y(t) = \sin^2 t$ (units in meters) where distance is measure in yards. How far does Charlotte travel from $t = 0$ to $t = \pi/2$ minutes? (You need not evaluate the integral.)

3. Find the area of the surface obtained by rotating the curve $y = 2\sqrt{1-x}$, $-1 \leq x \leq 0$, about the x -axis. (You need not evaluate the integral.) Sketch.

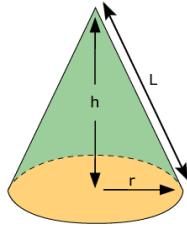
4. An inverted conical tank of height 20 feet and base radius of 10 feet is filled with olive oil weighing 51 lb/ft^3 . How much work does it take to pump all of the oil to the rim of the tank?

5. A swimming pool has the shape shown below:



- If the pool is 13 ft. deep, how much work is done in pumping all the water out? (Note: Water weighs $62.4 \text{ lbs per cubic foot}$.)

6. The Great Cone of Alphaville was built by high school students during their summer vacation. The cone is 100 feet high and its base has a diameter of 80 ft. It has been built from bricks (made of straw) which weigh 3 lbs/ft³. Express as a Riemann integral the amount of work done in



building the Great Cone.

7. A chlorine solution is poured over the surface of a rectangular swimming pool that is 20 meters long, 13 meters wide, and 2 meters deep everywhere. Before the circulating pumps are turned on, it is discovered that the density of the chlorine solution at a height h meters above the bottom of the pool is given by $\rho(h) = 100(2 - h)$ gm/m³. (That is, the chlorine solution's density is greater near the bottom of the pool.)

- Express the total mass of chlorine in the pool as a Riemann sum.
- Transform the Riemann sum of part (a) into a definite integral that gives the total mass of the chlorine solution in the pool. Evaluate the integral.

8. The density of cars (in cars per kilometer) down a 20 km stretch of the Auto-Route near Bordeaux is given by $\rho(x) = 600 + 120 \sin(\pi x)$ where x is the distance in miles from the toll plaza and $0 \leq x \leq 20$.

- Write a Riemann sum that estimates the total number of cars along this 20 km stretch.
- Convert this sum to a Riemann integral and evaluate it.

The good Christian should be wary of mathematicians and all those who make a practice of sacrilegious predictions, particularly when they speak the truth. Because the danger exists that these people, in league with the devil, may becloud the souls of men and enmesh them in the snares of hell.