

18.01A Recitation — Wednesday, Sept. 19, 2018

Quick Review:

- Surface area of solid of revolution
- Work
- Average value of a function $f(x)$ over $[a, b]$:

$$\frac{1}{b-a} \int_a^b f(x) dx.$$

- Substitution.

Practice problems:

1. Find the area of the region bounded by the following curves:

$$x = y^2, y = x + 3, y = -2, y = 1.$$

2. Set up the integral to find the area of the surface of revolution generated by revolving the following arc:

$$y = \sqrt{1-x}, x \geq 0,$$

about the x -axis.

3. The Great Pyramid of Egypt is perhaps the greatest single building ever erected by man. It was originally 482 ft high with a square base 765 ft on a side, and it covered an area large enough so that St. Peter's in Rome, the cathedrals of Milan and Florence, Westminster Abbey, and St. Paul's Cathedral in London could all be grouped within it. It contained enough stone to build a wall 1 ft thick and 7 ft high all the way around France' The Greek historian Herodotus said that it was built in 20 years by the labor of 100,000 men. Calculate the plausibility of this assertion as follows: Assume that the Pyramid is 756 ft high and at height h , the horizontal section of the pyramid is a square of side length $765 - 765/482h$. Assume that the Great Pyramid is made of stone that weighs 150 lb/ft^3 , that each laborer worked 10 hours per day for 350 days each year, and that each laborer did 200 ft-lb of effective work per hour in lifting stones from ground level to their final positions in the pyramid. If Herodotus' figure of 20 years is correct, approximately how many laborers were needed?