

## Practice Test IV A for Math 1501, Calculus I

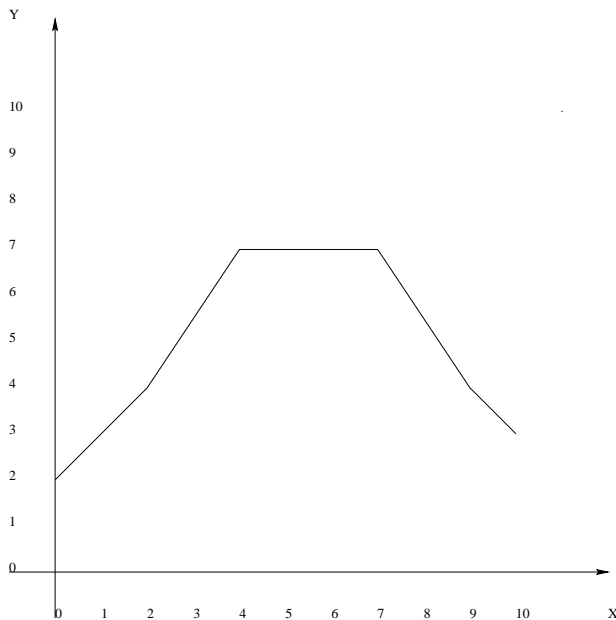
**Problem 1:** A two dimensional domain is bounded by the positive  $x$ -axis, the positive  $y$  axis and the curve  $\sqrt{x} + \sqrt{y} = \sqrt{a}$ .

- Sketch this domain.
- Compute its center of mass. (assume that the mass density is uniform).
- Rotating this shape about the  $x = y$  axis yields a solid. Compute the volume of that solid.
- Rotating this shape about the  $x = -y$  axis yields another solid. Compute the volume of that solid.

**Problem 2:** The great pyramid has a square base of about 250 m by 250 m. Its height is about 150 m . Suppose the stone used in its construction weighs 5000 kg per cubic meter. ( $g = 10m/s^2$ ).

- How much work was done to lift all the rock into place during its construction? (Give your answer in Joule).
- Assume that an average worker can deliver  $1/5$  horse power. How long would it take for 1000 workers to erect that pyramid? (1 hp = 750 W).

**Problem 3:** Find the closest integer to  $\int_2^9 f(x)dx$  if the graph of the function looks like



**Problem 4:** Consider the region in the  $x, y$  plane that lies above the graphs of  $y = x^2$  and  $x = 8y^2$  and below the graph of  $x = y^2$ . Find the area of this region.

**Problem 5:** Evaluate the following integrals:

$$\int_0^{\pi} \sqrt{\sin(x)} \cos^3(x) dx$$

$$\int x^5 \ln(x) dx$$

$$\int \tan^3(x) dx$$

$$\int_0^{\sqrt{\pi}} x^3 \sin(x^2) dx$$

$$\int_0^1 \frac{1+x}{1+\sqrt{x}} dx$$

$$\int_0^{\pi} e^x \cos(x) dx$$