



Bilkent University

Quiz # 09
Math 101-Section 05 Calculus I
23 November 2023 Thursday
Instructor: Ali Sinan Sertöz
Solution Key

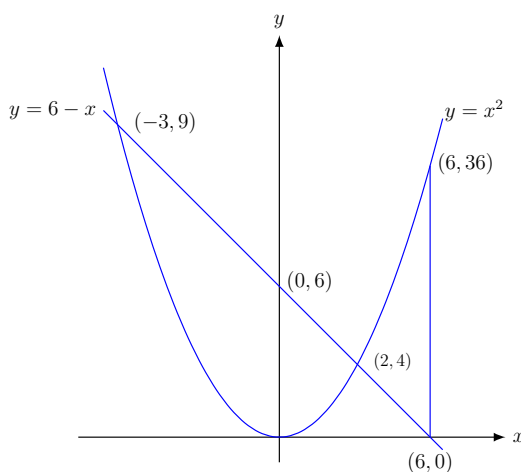
Q-1) Consider the curves $y = x^2$ and $y = 6 - x$.

- (a) Set up the integral which gives the area of the region between these curves on $[-3, 6]$.
- (b) Set up the integral which gives the volume of the solid obtained by revolving the region of part (a) around the x -axis.
- (c) Set up the integral which gives the volume of the solid obtained by revolving around the y -axis the region between these curves on $[-3, 0]$.
- (d) Evaluate one of the above integrals.

Grading: 3+3+3+1=10 points

Solution: (Grader: taha.yigit@ug.bilkent.edu.tr)

Here is the graph:



(a) : Area = $\int_{-3}^2 [(6-x) - (x^2)] dx + \int_2^6 [(x^2) - (6-x)] dx = \frac{125}{6} + \frac{184}{3} = \frac{493}{6}$.

(b) : Volume = $\pi \int_{-3}^2 [(6-x)^2 - (x^2)^2] dx + \pi \int_2^6 [(x^2)^2 - (6-x)^2] dx = \frac{500}{3} \pi + \frac{22912}{15} \pi = \frac{25412}{15} \pi$.

(c) : Volume = $\pi \int_0^6 (\sqrt{y})^2 dy + \pi \int_6^9 [(\sqrt{y})^2 - (6-y)^2] dy = 18\pi + \frac{27}{2} \pi = \frac{63}{2} \pi$.

(c') : Volume = $2\pi \int_{-3}^0 (-x)[(6-x) - (x^2)] dx = \frac{63}{2} \pi$.