

AP Calculus
Unit 5 - Applications of Integrals
Review

All of the following questions are AP Exam level questions that will require considerable thought. Show all your work neatly on a separate sheet of paper and then show Mr. Singh at your earliest convenience!

1. Determine the area enclosed by: $y = \sin x$, $y = \cos x$, $x = \frac{\pi}{2}$, y -axis. [Ans: $2\sqrt{2} - 2$]
2. Determine the area in the 1st quadrant, enclosed by: $y = x^2$, $y = \frac{1}{x}$, $y = 4$. (GC) [Ans: 2.053]
3. Given, $G(5) = -10$, $G(-3) = 2$, determine the value of $\int_{-3}^5 2 + g(x) dx$. [Ans: 4]
4. Given, $g(-7) = 2$, $g(2) = -4$, determine the value of $\int_{-7}^2 3 + g'(x) dx$ [Ans: 21]
5. Solve for a : $\int_a^{2a} x^2 - ax - 2 dx = -\frac{26a}{3}$. [Ans: 0, ± 4]
6. The signed area under the graph of $f(x) = 3e^{-3x}$ between $x = -2$ and $x = k$ is 400, $k > -2$. Determine the value of k . (GC) [Ans: -0.411]

Determine the volume of the solid obtained when the area between the following curves is revolved about the given axes:

7. $y = x^2 + 2$, $y = x + 4$, about x -axis [Ans: $\frac{162}{5}\pi$]
8. $y = x^3$, $y = x$, $x \geq 0$, about $y = -2$ [Ans: $\frac{25}{21}\pi$]
9. $y = x^3$, $y = x$, $x \geq 0$, about $y = 5$ [Ans: $\frac{97}{42}\pi$]
10. $y = x$, $y = \sqrt{x}$, about $x = -3$ [Ans: $\frac{17}{15}\pi$]

Determine the volume of the solid with base as the region enclosed by the following curves and the given cross section shapes:

11. $y = \sqrt{1-x^2}$, x -axis, squares, semi-circles, and equilateral triangles. [Ans: $\frac{4}{3}, \frac{\pi}{6}, \frac{\sqrt{3}}{3}$]
12. $y = x + 1$, $y = x^2 + 1$, squares, rectangles with height of 1 unit. [Ans: $\frac{81}{10}, \frac{9}{2}$]
13. $x^2 + y^2 = 4$, squares, semi-circles. (GC) [Ans: 42.667, 16.755]