

No calculators are to be used in this set of problems.

For Problems 1 and 2, region R is bounded by $f(y) = y^2 - 3$ and $g(y) = 3y + 1$.

1. Which of the following expressions gives the area of region R ?

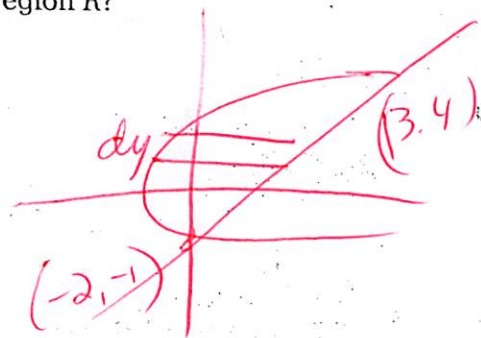
(A) $\int_{-2}^{13} (3y + 1) - (y^2 - 3) dy$

(B) $\int_{-2}^{13} (y^2 - 3) - (3y + 1) dy$

(C) $\int_{-1}^4 (3y + 1) - (y^2 - 3) dy$

(D) $\int_{-1}^4 (y^2 - 3) - (3y + 1) dy$

(E) $\int_{-1}^4 (3y + 1) + (y^2 - 3) dy$



2. Which of the following expressions gives the volume when region R is rotated about the line $x = -3$?

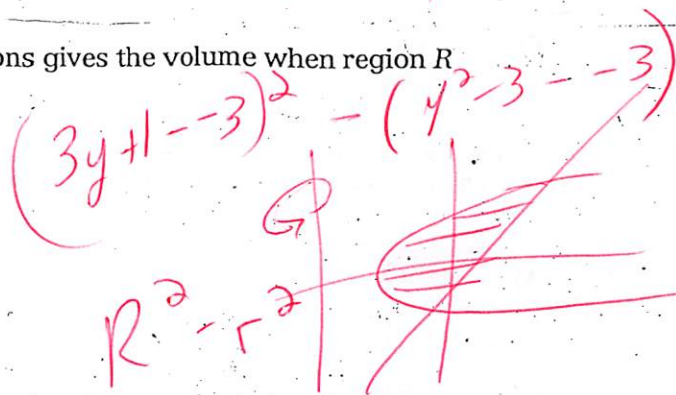
(A) $\pi \int_{-2}^{13} [(3y + 4) - (y^2)]^2 dy$

(B) $\pi \int_{-2}^{13} [(6 - y^2) - (2 - 3y)]^2 dy$

(C) $\pi \int_{-1}^4 (2 - 3y)^2 - (6 - y^2)^2 dy$

(D) $\pi \int_{-1}^4 (y^2 - 3)^2 - (3y + 1)^2 dy$

(E) $\pi \int_{-1}^4 [(3y + 4)^2 - (y^2)^2] dy$



For problems 3 and 4, region Q is bounded by $y = \sin 2x$, $y = 0$, $x = 0$ and $x = \frac{\pi}{2}$.

3. What is the area of region Q ?

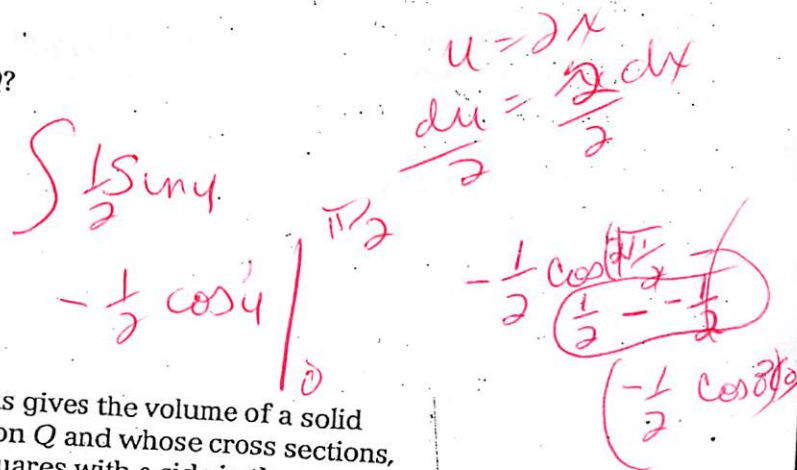
(A) 0

(B) $\frac{1}{2}$

(C) $\frac{\pi}{2}$

(D) 1

(E) None of these



4. Which of the following expressions gives the volume of a solid whose base in the xy -plane is region Q and whose cross sections, perpendicular to the x -axis, are squares with a side in the xy -plane?

(A) $\pi \int_0^{\frac{\pi}{2}} (1 - \cos^2 2x) dx$

(B) $\int_0^{\frac{\pi}{2}} \sin^2 2x dx$

(C) $\int_0^{\frac{\pi}{2}} (1 - \cos 2x) dx$

(D) $\int_0^{\frac{\pi}{2}} (1 - \cos 2x^2) dx$

(E) $\pi \int_0^{\frac{\pi}{2}} \sin(2x)^2 dx$

Example 3: The base of a solid is the region in the first quadrant enclosed by the parabola $y = 4x^2$, the line $x = 1$, and the x -axis. Each plane section of the solid perpendicular to the x -axis is a square. The volume of the solid is

- A) $\frac{4\pi}{3}$
B) $\frac{16\pi}{5}$
C) $\frac{4}{3}$
D) $\frac{16}{5}$
E) $\frac{64}{5}$

Example 4: The base of a solid is a region in the first quadrant bounded by the x -axis, the y -axis, and the line $x + 2y = 8$. If the cross sections of the solid perpendicular to the x -axis are semicircles, what is the volume of the solid?

- A) 12.566
B) 14.661
C) 16.755
D) 67.021
E) 134.041

Example 5: The base of a solid is the region in the first quadrant enclosed by the graph of $y = 2 - x^2$ and the coordinate axes. If every cross section of the solid perpendicular to the y -axis is a square, the volume of the solid is given by

- A) $\pi \int_0^2 (2 - y)^2 dy$
B) $\int_0^2 (2 - y) dy$
C) $\pi \int_0^{\sqrt{2}} (2 - x^2)^2 dx$
D) $\int_0^{\sqrt{2}} (2 - x^2)^2 dx$
E) $\int_0^{\sqrt{2}} (2 - x^2) dx$