Classroom Voting Questions: Calculus II

Section 8.2 Applications to Geometry

1. Find the area of the region \( R \) bounded by the graphs of \( f(x) = x^2 \) and \( g(x) = \sqrt{x} \).

   (a) \( \frac{1}{3} \)
   (b) \( \frac{7}{6} \)
   (c) \( -\frac{1}{3} \)
   (d) None of the above

2. True or False The volume of the solid of revolution is the same whether a region is revolved around the \( x \)-axis or the \( y \)-axis.

   (a) True, and I am very confident
   (b) True, but I am not very confident
   (c) False, but I am not very confident
   (d) False, and I am very confident

3. Imagine taking the enclosed region in Figure 8.8 and rotating it about the \( x \)-axis. Which of the following graphs (a)-(d) represents the resulting volume as a function of \( x \)?

   ![Figure 8.8](image-url)
4. Imagine taking the enclosed region in Figure 8.9 and rotating it about the $y$-axis. Which of the following graphs (a)-(d) represents the resulting volume as a function of $x$?

![Figure 8.9](image)

5. Imagine that the region between the graphs of $f$ and $g$ in Figure 8.10 is rotated about the $x$-axis to form a solid. Which of the following represents the volume of this solid?

![Figure 8.10](image)

(a) $\int_{0}^{d} 2\pi x (f(x) - g(x)) \, dx$

(b) $\int_{0}^{d} (f(x) - g(x)) \, dx$

(c) $\int_{0}^{d} \pi (f(x) - g(x))^2 \, dx$

(d) $\int_{0}^{d} (\pi f^2(x) - \pi g^2(x)) \, dx$

(e) $\int_{0}^{d} \pi x (f(x) - g(x)) \, dx$

6. Imagine rotating the enclosed region in Figure 8.11 about three lines separately: the $x$-axis, the $y$-axis, and the vertical line at $x = 6$. This produces three different volumes. Which of the following lists those volumes in order from largest to smallest?
7. Let $R$ be the region bounded by the graph of $f(x) = x$, the line $x = 1$, and the $x$-axis. True or false: The volume of the solid generated when $R$ is revolved about the line $x = 3$ is given by $\int_0^1 2\pi x (3 - x) \, dx$.

(a) True, and I am very confident.
(b) True, but I am not very confident.
(c) False, but I am not very confident.
(d) False, and am very confident.

8. Let $R$ be the region bounded by the graph of $y = x$, the line $y = 1$, and the $y$-axis. If the shell method is used to determine the volume of the solid generated when $R$ is revolved about the $y$-axis, what integral is obtained?

(a) $\int_0^1 \pi y^2 \, dy$
(b) $\int_0^1 2\pi x^2 \, dx$
(c) $\int_0^1 2\pi x (1 - x) \, dx$
(d) None of the above
9. The figure below shows the graph of \( y = (x + 1)^2 \) rotated around the \( x \)-axis.

The volume of the approximating slice that is \( x_i \) units away from the origin is

(a) \( \pi \frac{81x_i^2}{4} \Delta x \)
(b) \( \pi x_i^2 \Delta x \)
(c) \( \pi (x_i + 1)^2 \Delta x \)
(d) \( \pi (x_i + 1)^4 \Delta x \)

10. An integral that would calculate the volume of the solid obtained by revolving the graph of \( y = (x + 1)^2 \) from \( x = 1 \) to \( x = 2 \) around the \( y \)-axis is:

(a) \( \int_1^2 \pi (\sqrt{y} - 1)^2 \, dx \)
(b) \( \int_0^9 \pi (x + 1)^4 \, dx \)
(c) \( \int_1^2 \pi (\sqrt{y} - 1)^2 \, dy \)
(d) \( \int_0^9 \pi (\sqrt{y} - 1)^2 \, dx \)

11. The length of the graph of \( y = \sin(x^2) \) from \( x = 0 \) to \( x = 2\pi \) is calculated by

(a) \( \int_0^{2\pi} (1 + \sin(x^2)) \, dx \)
(b) \( \int_0^{2\pi} \sqrt{1 + \sin(x^2)} \, dx \)
(c) \( \int_0^{2\pi} \sqrt{1 + (2x\sin(x^2))^2} \, dx \)
(d) \( \int_0^{2\pi} \sqrt{1 + (2x\cos(x^2))^2} \, dx \)