AP Calculus Homework Ten – Applications of Definite Integral and Polar Coordinates

5.1 Area and Solids of Revolution

In Questions 1 - 6, evaluate the area of the region whose boundaries are given.

1. The parabola of $y = x^2 - 3$ and the line $y = 1$.

2. The curve of $x = y^2 - 1$ and the y – axis.

3. The curve of $y = 4/(x^2 + 4)$, the x-axis, and the vertical lines $x = -2$, and $x = 2$.

4. The parabolas $x = y^2 - 5y$ and $x = 3y - y^2$.

5. Bounded above by the curve $y = \sin x$ and below by $y = \cos x$ from $x = \pi/4$ to $x = 5\pi/4$.

6. Find the area bounded by $y = e^x$, $y = 2$, and the y-axis.

In Questions 7 - 10, the region whose boundaries are given is rotated about the line indicated. Calculate the volume of the solid generated.

7. $y = x^2$, $x = 2$, and $y = 0$; about the x-axis.

8. $y = x^2$, $x = 2$, and $y = 0$; about the y-axis.

9. $y = x^2$ and $y = 4$; about the line $y = 4$.

10. An arch of $y = \sin x$ and the x-axis; about the x-axis.

In Questions 11 and 12, calculate the volume, if it exists, of the solid generated.

11. $y = 1/x$, at the left by $x = 1$, and below by $y = 0$; about the x –axis.

12. The first-quadrant region under $y = e^{-x}$; about the x-axis.

In Questions 13 - 15, the region whose boundaries are given is rotated about the line indicated. Derive a definite integral that gives the volume of the solid generated.

13. $y = x^2$ and $y = 4$; about the line $y = -1$.

14. $y = \ln x$, $y = 0$, $x = e$; about the line $x = e$.

15. The curve with parametric equation $x = \tan\theta$, $y = \cos^2\theta$, and the lines $x = 0$, $x = 1$, and $y = 0$; about the x-axis.