



**EMAT101L**  
**Engineering Calculus**  
**Tutorial Sheet 8**  
**(Applications of Integrals)**

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1. Find the area of the region bounded by the given curves.

(a)  $f(x) = 2x^2 + 5x - 3$  and  $g(x) = x^2 + 4x - 1$

Ans.  $\frac{9}{2}$

(b)  $f(x) = \sin x$  and  $g(x) = \cos x$  from  $x = 0$  to  $x = \frac{\pi}{4}$

Ans.  $\sqrt{2} - 1$

(c)  $x = 2y^2$  and  $x + y = 1$

Ans.  $\frac{9}{8}$

(d)  $y = 2x, y = 5x$  and  $x = 3$

Ans.  $\frac{27}{2}$

(e)  $y = x^2$  and  $x = y^2$

Ans.  $\frac{1}{3}$

2. Use the Disk/Washer to find the volume of the solid of revolution formed by rotating the region about each of the given axes. Region bounded by:  $y = \sqrt{x}, y = 0$  and  $x = 1$ .

Rotated about

(a) the  $x$ -axis      Ans.  $\frac{\pi}{2} \text{ unit}^3$

(b)  $y = 1$       Ans.  $\frac{\pi}{6} \text{ unit}^3$

(c) the  $y$ -axis      Ans.  $\frac{\pi}{5} \text{ unit}^3$

(d)  $x = 1$       Ans.  $\frac{8}{15}\pi \text{ unit}^3$

3. Find the volume of the following solids of revolution using the Shell method.

Region bounded  $y = \sqrt{x}$ ,  $y = 0$  and  $x = 1$  and rotated about  $x = 3$ .

Hint:  $r(x) = 3 - x$  and  $h(x) = \sqrt{x}$ , Ans.  $\frac{16\pi}{5}$  unit<sup>3</sup>.

4. Find the volume of the solid of revolution where  $y = \sin x$  on  $[0, \pi/2]$  is revolved around the  $x$ -axis.

Hint: Use disk method, Ans.  $\frac{\pi^2}{4}$  unit<sup>3</sup>

5. Find the volume of the solid created when the area between  $f(x) = x^2 + 1$  and  $g(x) = x$  on  $[0, 1]$  is rotated about  $x$ -axis.

Hint: Use the Washer method, Ans.  $\frac{23}{15}\pi$  unit<sup>3</sup>

6. Find the volume of the solid created when the area contained by  $f(x) = x^2$  and  $g(x) = x^3$  is revolved around the  $x$ -axis.

Hint: Use the Washer method, Ans.  $\frac{2}{35}\pi$  unit<sup>3</sup>

7. Using the Shell method, find the volume of the region enclosed by  $y = \sqrt{x}$ ,  $x = 1$  and  $x = 4$  when revolved about  $y$ -axis.

Ans.  $2\pi \int_1^4 x\sqrt{x} \, dx = \frac{124}{5}\pi$  unit<sup>3</sup>

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