Volume of Known Cross Sections

W-up: Find the distance between $f(x)=\sqrt{x}$ and $g(x)=\frac{1}{4}x^2$ when x equals:

A) 0 B) 1 C) 2 D) ***at any x***

Find the distance between $f(x)=\sqrt{x}$ and $g(x)=\frac{1}{4}x^2$ when y equals:

A) 0 B) .5 C) 1 D) ***at any y***

Volume of Known Cross Sections : Finding the volume of a solid created by adding an infinite number of similar figures of the same type(these are the known cross sections).

Volume of a cross sections perpendicular to the x-axis

$$V=\int_a^b \mathrm{A}(x)\,dx$$

Where $\mathrm{A}(x)$ represents the algebraic expression for the area of any cross section on $[a, b]$

Volume of a cross sections perpendicular to the y-axis

$$V=\int_c^d \mathrm{A}(y)\,dy$$

Where $\mathrm{A}(y)$ represents the algebraic expression for the area of any cross section on $[c, d]$

Commonly used Area Formulas

Square: $A=b^2$

Circle: $A=\pi r^2$

Rectangle: $A=b\bullet h$

Trapezoid: $A=\frac{1}{2}(b_1+b_2)\bullet h$

Triangle: $A=\frac{1}{2}b\bullet h$

Ellipse: $A=\pi\bullet b\bullet h$

Equilateral Triangle: $A=\frac{\sqrt{3}}{4}b^2$

Isosceles Right Triangle: $A=\frac{1}{4}b^2$

Note: "b" represents the functional expression for distance between curves!

EX) The region bounded by the curves $f(x)=\sqrt{x}$ and $g(x)=\frac{1}{4}x^2$ is the base of a solid.

A) Find the volume of a solid whose cross sections perpendicular to the x-axis are:

1) squares
2) rectangles of height 3
3) semicircles

B) Find the volume of a solid whose cross sections perpendicular to the y-axis are:

1) triangles of height 5
2) equilateral triangles