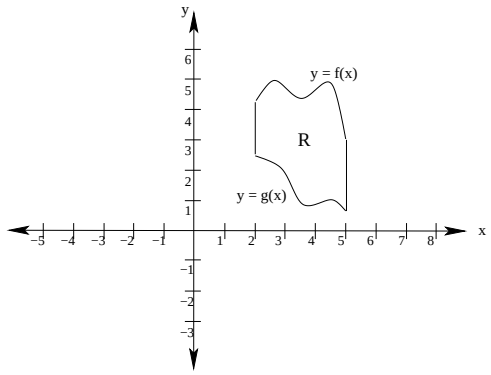
1. Let R be the region bounded by the graphs of $y = f(x)$, $y = g(x)$, $x = 2$, and $x = 5$ (see graph below).



Set up an integral (you do **not** need to evaluate it) that can be used to find each of the following:

(a) The area of R

(b) The volume of the solid generated if R is revolved about the x-axis.

(c) The volume of the solid generated if R is revolved about the y-axis.

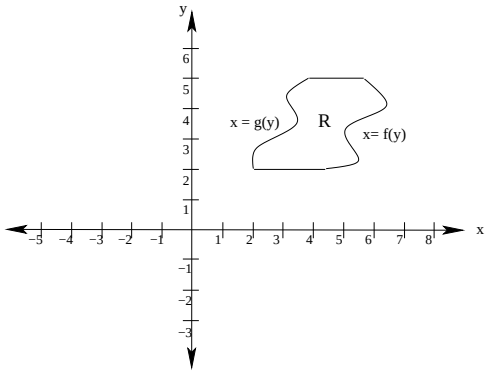
(d) The volume of the solid generated if R is revolved about $x = 9$.

(e) The volume of the solid generated if R is revolved about $x = -4$.

(f) The volume of the solid generated if R is revolved about $y = 8$.

(g) The volume of the solid generated if R is revolved about $y = -2$.

2. Let R be the region bounded by the graphs of $x = f(y)$, $x = g(y)$, $y = 2$, and $y = 5$ (see graph below).



Set up an integral (you do **not** need to evaluate it) that can be used to find each of the following:

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(d) The volume of the solid generated if R is revolved about $x = 9$.

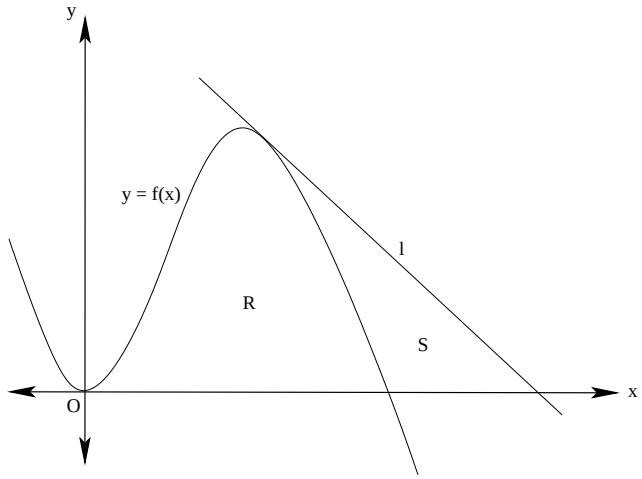
(e) The volume of the solid generated if R is revolved about $x = -4$.

(f) The volume of the solid generated if R is revolved about $y = 8$.

(g) The volume of the solid generated if R is revolved about $y = -2$.

3. A doughnut-shaped solid is called a **torus**. Use the washer method to calculate the volume of the torus obtained by rotating the region inside the circle with equation $(x-a)^2+y^2=b^2$ around the y-axis (assume that $a > b$). Hint: Evaluate the integral by interpreting it as the area of a circle.

4. Let R be the region bounded by the ellipse $\dfrac{x^2}{a^2}+\dfrac{y^2}{b^2}=1$. Show that the solid obtained by rotating R about the y-axis (called an **ellipsoid**) has volume $\frac{4}{3}\pi a^2 b$.



5. (From the 200? AP Calculus AB exam.) Let f be the function given by $f(x) = 4x^2 - x^3$, and let ℓ be the line $y = 18 - 3x$, where ℓ is tangent to the graph of f. Let R be the region bounded by the graph of f and the x-axis, and let S be the region bounded by the graph of f, the line ℓ, and the x-axis, as shown above. Find the volume of the solid generated when R is revolved about the x-axis.

6. (From the 200? AP Calculus AB exam.) Let R be the region enclosed by the graph of $y = \sqrt{x-1}$, the vertical line $x = 10$, and the x-axis.

   (a) Find the area of R.

   (b) Find the volume of the solid generated when R is revolved about the horizontal line $y = 3$.

   (c) Find the volume of the solid generated when R is revolved about the vertical line $x = 10$.