

Area Between Curves

- **Integrating in x.** Let R be the region bounded above by $y = g(x)$, below by $y = f(x)$, on the left by $x = a$, and on the right by $x = b$. Then the area of R is

$$\int_a^b (g(x) - f(x)) dx.$$

- **Integrating in y.** Let R be the region bounded on the right by $x = g(y)$, on the left by $x = f(y)$, below by $y = c$, and above by $y = d$. Then the area of R is

$$\int_c^d (g(y) - f(y)) dy.$$

Examples.

1. Find the area of the region bounded by $y = x^4$ and $y = 1$.
2. Find the area of the region between the graphs of $f(x) = (x - 1)^3$ and $g(x) = x - 1$.
3. Find the area of the region bounded by $x = 1 - y^2$, $x = y + 2$, $y = 1$, and $y = -1$.