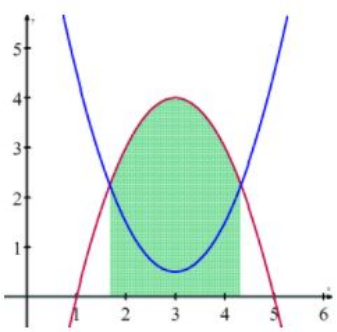
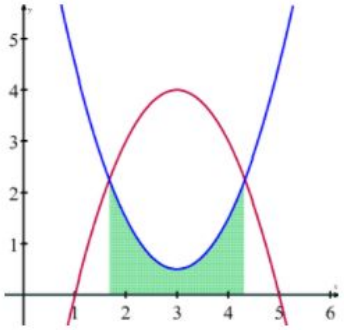
We can extend the idea of definite integrals finding the area of a region *under* a curve to the area of a region *between* two curves. If two functions are both continuous on an interval [a, b], then the region between the curves can be found by **subtracting the area of the upper region and the area of the lower region.**



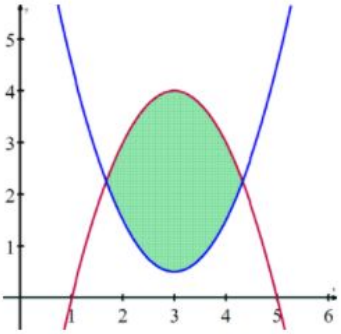
Area of upper function (–)

f(x)



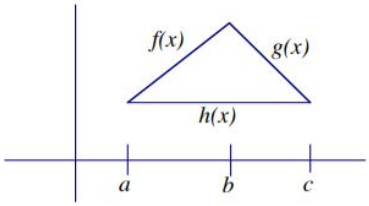
Area of lower function =

g(x)



Area between the functions

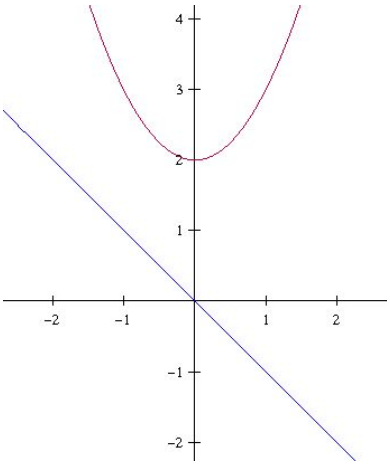
$$\int_a^b (f(x)-g(x))dx$$



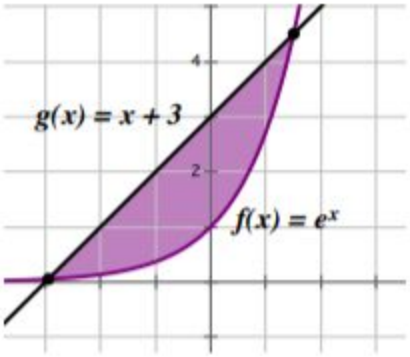
Area from *a* to *c*

$$A = \int_a^b [f(x)-h(x)]\,dx + \int_b^c [g(x)-h(x)]\,dx$$

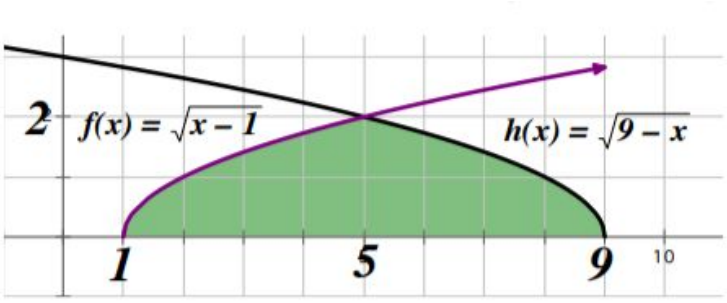
1. Find the area of the region bounded by $y = x^2 + 2$, $y = -x$, $x = -1$, $x = 2$.



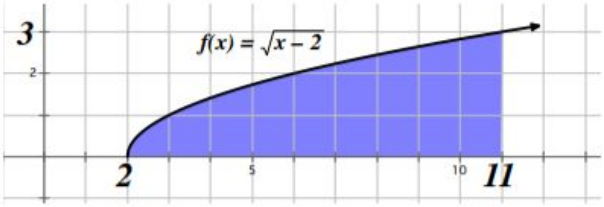
2. Find the area of the region bounded by $f(x) = e^x,\ g(x) = x + 3$



3. Find the area of the shaded region bounded by the x-axis and $f(x)$ and $h(x)$



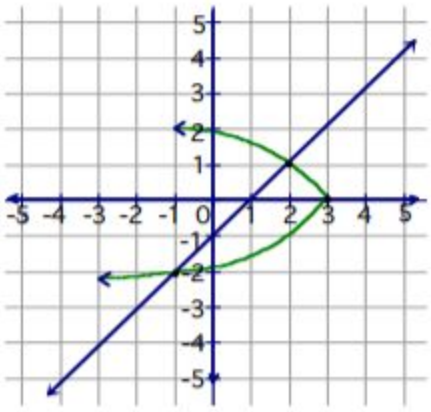
4. Find the area of the shaded region from $[2,\ 11]$



5. Find the area of the region bounded by $y = \frac{1}{2}x^3 + 2$ and $y = x + 1$

6. Find the area of the region bounded by $f(x) = x^2 - 4x$ and $g(x) = 0$

7. Find the area of the region bounded by the graphs of $x = 3 - y^2$ and $x = y + 1$



8. Find the area of the region bounded by $f(x) = 2\sin x$ and $g(x) = \tan x$

9. Find the area of the region bounded by $f(x) = x^3 - 3x^2 + 3x$ and $g(x) = x^2$

10. Find the area of the region bounded by $f(x) = x^4 - 2x^2 + 1$ and $g(x) = 1 - x^2$