6.1. Areas Between Curves

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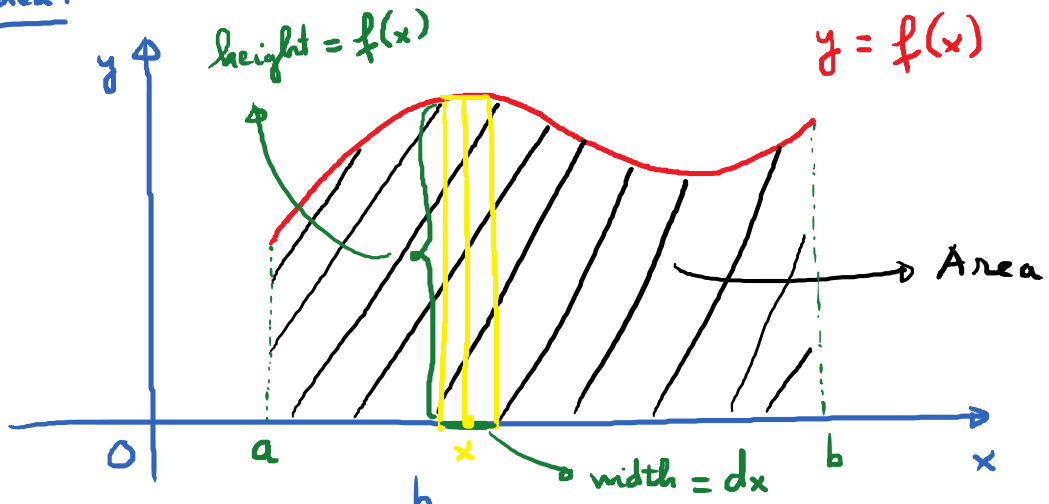
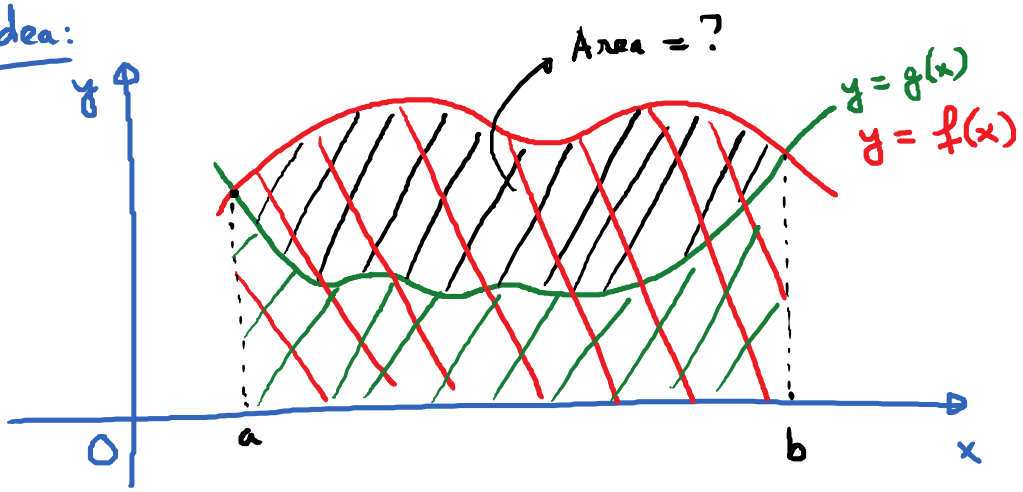
Idea:



$$\text{Shaded Area} = \int_a^b f(x)\,dx$$

Sum — $\int$ — a — b — $f(x)$ — height — width — area of a small rectangle

Idea:



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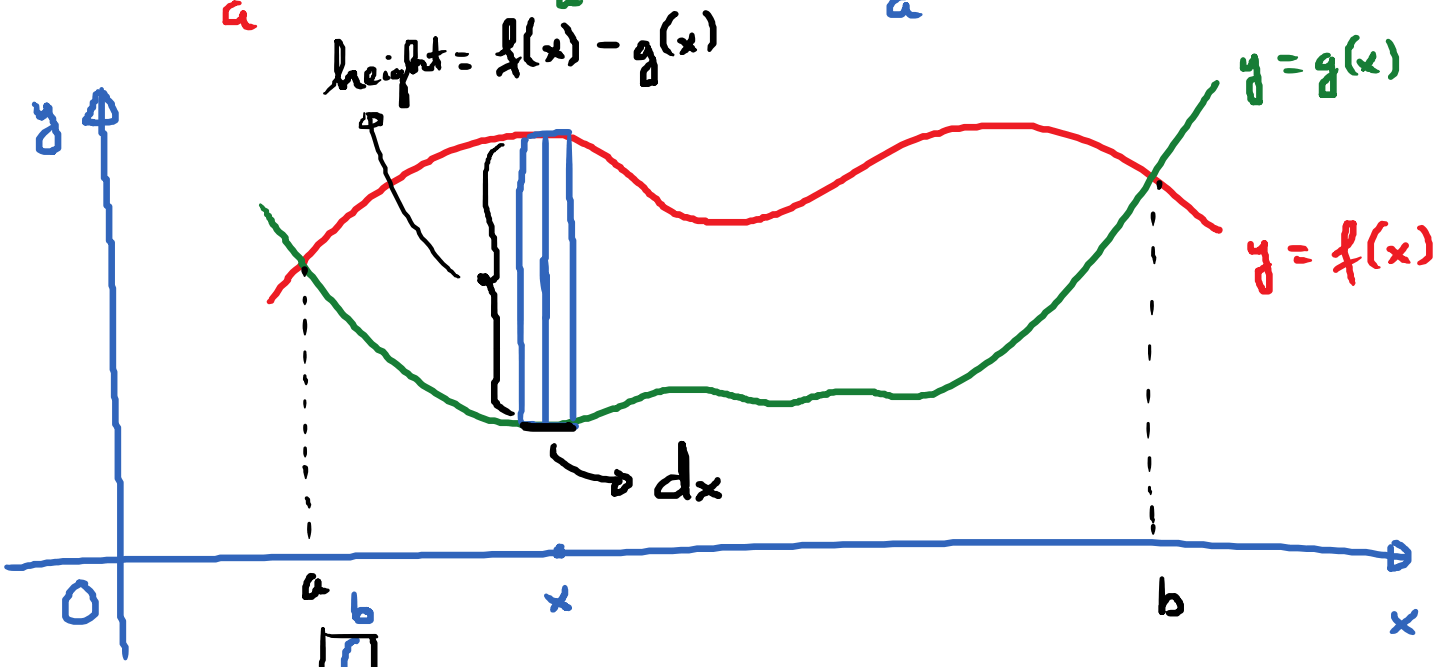
$$\text{Shaded Area} = \int_a^b [f(x) - g(x)]\,dx$$

$$\int_a^b f(x)\,dx - \int_a^b g(x)\,dx = \int_a^b [f(x) - g(x)]\,dx$$



Sum $\int_a^b [f(x) - g(x)]\,dx$

height × width

area of small rectangle

$$\rightarrow \text{Area} = \int_a^b (\text{top function} - \text{bottom function})\,dx.$$

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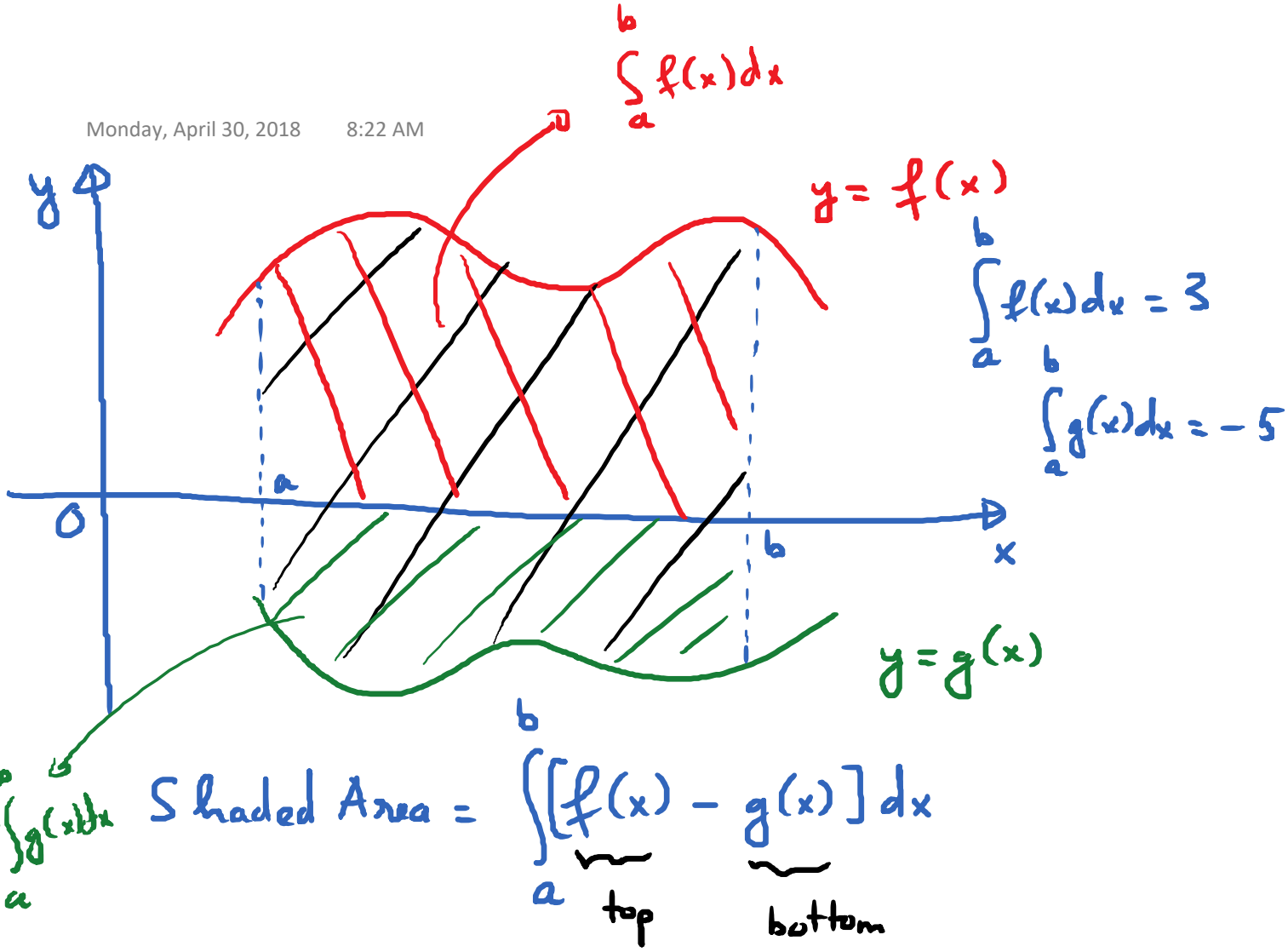
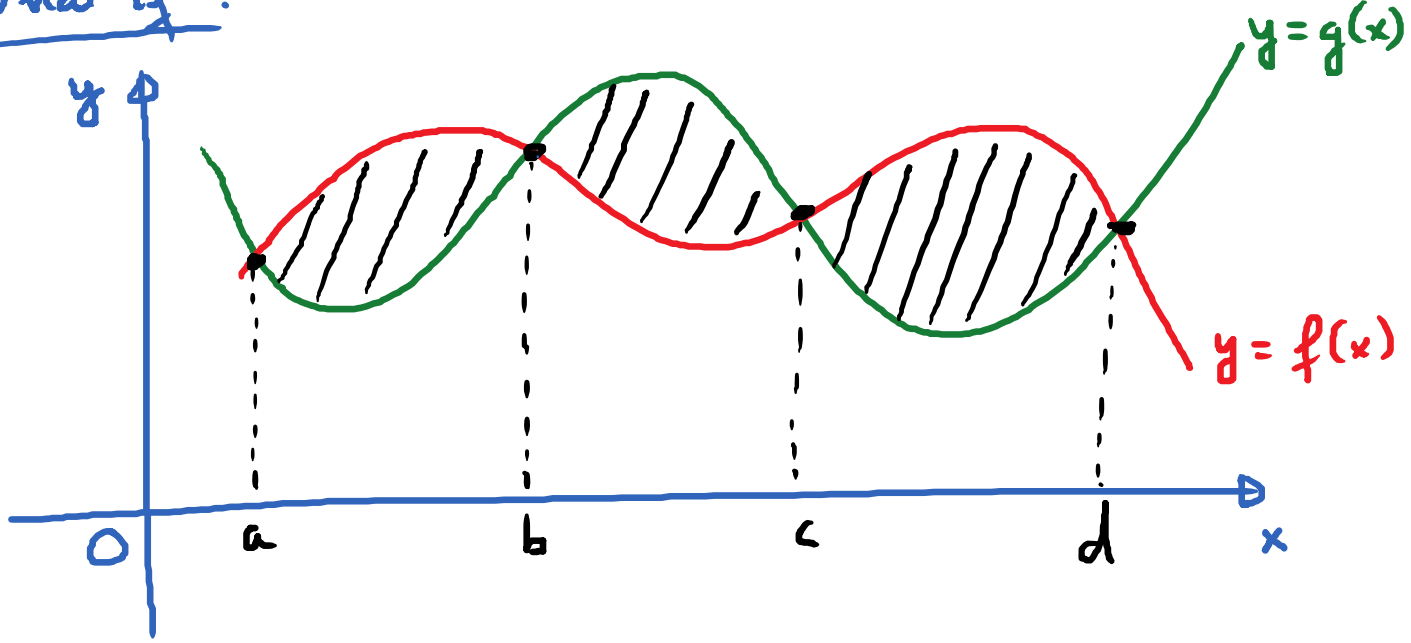


Shaded Area $= \int_a^b [f(x) - g(x)]\,dx$

top bottom

What if ?



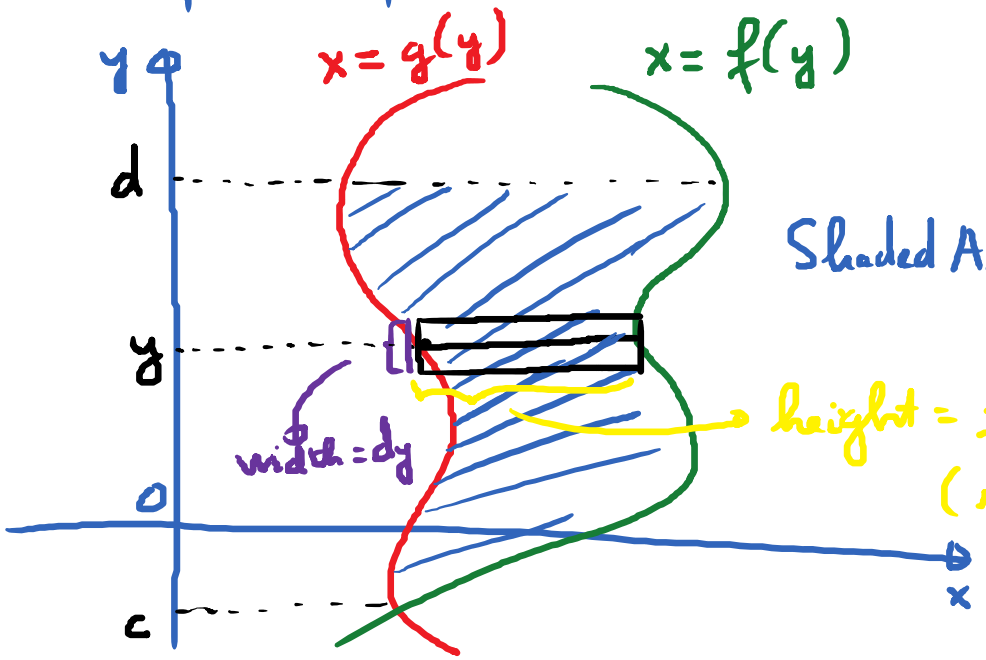
x-coordinates of points of intersection: Set $f(x) = g(x)$ and solve for x.

$$\text{Shaded Area} = \int_a^b [f(x) - g(x)]\,dx + \int_b^c [g(x) - f(x)]\,dx + \int_c^d [f(x) - g(x)]\,dx.$$

$$= F(b) - F(a) + F(c) - F(b) + F(d) - F(c)$$

where $F(x) = \int [f(x) - g(x)]\,dx$

What if the functions are given in terms of y?



$$\text{Shaded Area} = \int_c^d [f(y) - g(y)]\,dy$$

height = $f(y) - g(y)$ (right most − left most)

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HW #1