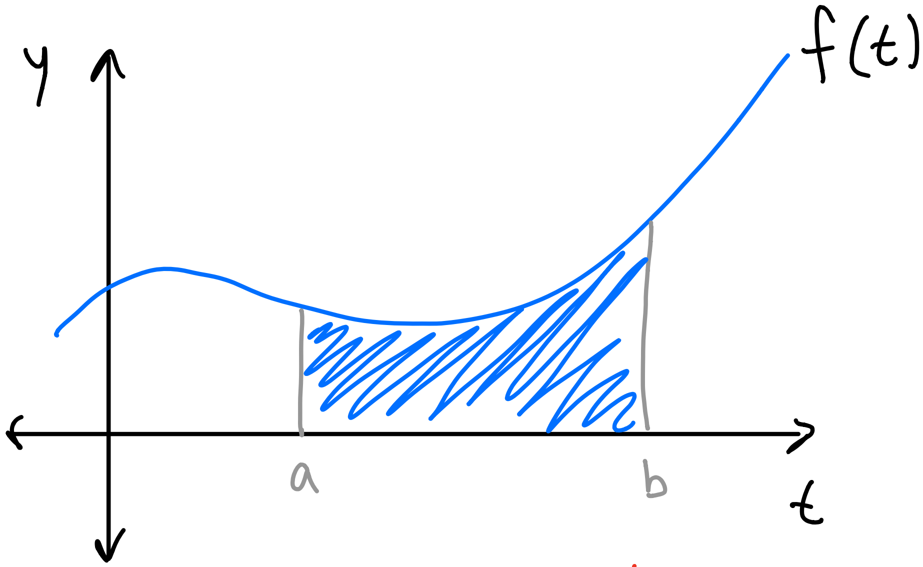


antiderivative

$$F(x) = \int_a^x f(t)\,dt$$

x is between a and b

$$\frac{dF}{dx} = \frac{d}{dx}\int_a^x f(t)\,dt = f(x)$$

$$\text{derivative} \underset{\text{differentiate}}{\overset{\text{integrate}}{\rightleftarrows}} \text{function} \underset{\text{differentiate}}{\overset{\text{integrate}}{\rightleftarrows}} \text{antiderivative}$$

1) $\int 6x^5 - 18x^2 + 7\, dx$

antiderivative
(integral)
$\downarrow$
function

$= x^6 - 6x^3 + 7x + c$

2) $\int 6x^5\, dx - 18x^2 + 7$

$= x^6 + c - 18x^2 + 7$

3) Determine $f(x)$ given that
$f'(x) = 6x^8 - 20x^4 + x^2 + 9$

$\int f'(x) = f(x)$

$\int 6x^8 - 20x^4 + x^2 + 9\, dx$

$= \frac{2}{3}x^9 - 4x^5 + \frac{1}{3}x^3 + 9x + c$

4) $\int \frac{4}{x^2} + 2 - \frac{1}{8x^3}\, dx$

$= \int 4x^{-2} + 2 - \frac{1}{8} x^{-3}$

$= -4x^{-1} + 2x + \frac{1}{16} x^{-2} + c$

$= \frac{-4}{x} + 2x + \frac{1}{16x^2} + c$

5) $\int \sqrt{z}\left(z^2 - \frac{1}{4z}\right) dz$

$= \int z^{5/2} - \frac{1}{4z^{1/2}}\, dz$

$= \int z^{5/2} - \frac{1}{4} z^{-1/2}\, dz$

$= \frac{2}{7} z^{7/2} - \frac{1}{2} z^{1/2} + c$

6) $f(\theta) = e + \sec^2\theta - e^{\theta}$

$= \int e + \sec^2\theta - e^{\theta}\, d\theta$

$= \int \sec^2\theta\, d\theta - \int e^{\theta}\, d\theta + e$

$= \tan\theta - e^{\theta} + e\theta$

7) $\int 2\cos(x) - \sec(x)\tan(x)\,dx$

8) $\int 6\cos(z) + \dfrac{4}{\sqrt{1-z^2}}\,dz$

9) Determine $h(t)$ given that:

$$h''(t) = 24t^2 - 48t + 2$$

$$h(1) = -9$$

$$h(-2) = -4$$

$$h'(t) = 8t^3 - 24t^2 + 2t + c$$

$$h(t) = 2t^4 - 8t^3 + t^2 + \underline{c}t + \underline{d}$$

$$h(1) = 2(1)^4 - 8(1)^3 + 1^2 + c + d = 9$$

① $-5 + c + d = 9$

$$h(-2) = 2(-2)^4 - 8(-2)^3 + (-2)^2 - 2c + d = -4$$

② $100 - 2c + d = -4$

$$f(x) = \cos x - \sin x + cx + d$$

$$f(0) = 1$$

$$f(\pi) = 0$$

$$1 = \cos(0) - \sin(0) + 0 + d$$

$$1 = 1 - 0 + 0 + d$$

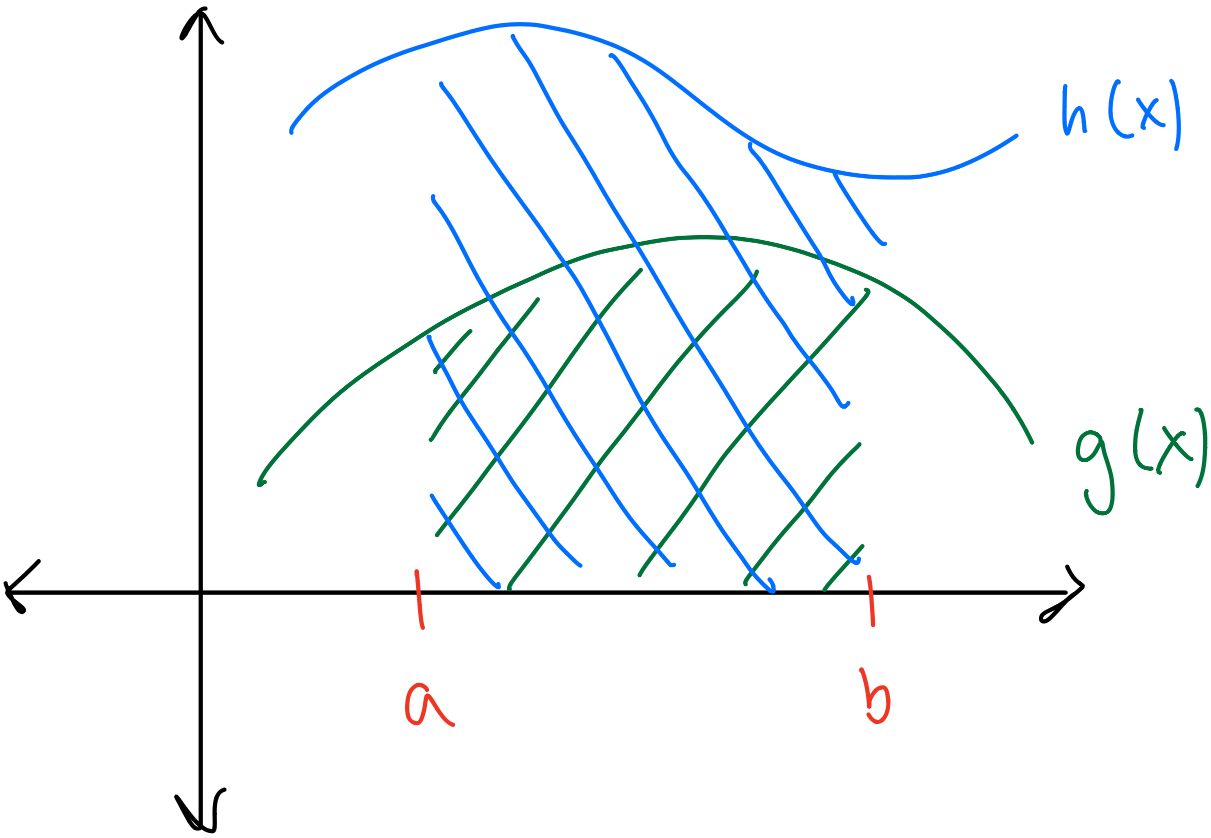
$$d = 0$$

$$0 = \cos(\pi) - \sin(\pi) + \pi c + d$$

$$0 = -1 - 0 + \pi c$$

$$1 = \pi c$$

$$c = \frac{1}{\pi}$$



$$\int_a^b g(x) - h(x)\, dx \leq 0$$

$$\int_a^b g(x)\, dx - \int_a^b h(x)\, dx \leq 0$$

T / F ?

$$h(x) = \int_0^x t \sin(t)\, dt$$

function

Find $h'(x)$