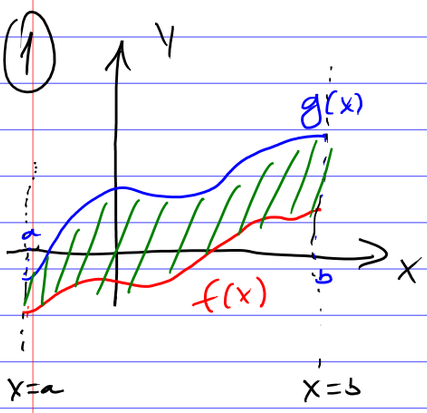
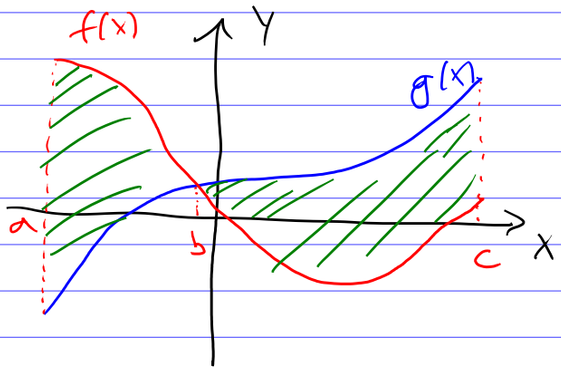
Área entre curvas

(1)



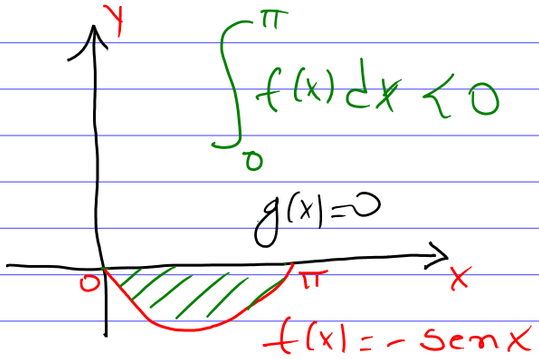
$$\int_a^b \left(g(x) - f(x)\right) dx$$

(2)



$$A = \int_a^b \left(f(x) - g(x)\right) dx + \int_b^c \left(g(x) - f(x)\right) dx$$

(3)



$$\int_0^\pi f(x)\,dx < 0$$

Qual é o valor da área hachurada?

$$A = \int_0^\pi \{g(x) - f(x)\}\, dx$$

Função que delimita superiormente

Função que delimita inferiormente

$$A = \int_0^\pi [0 - (-\operatorname{sen} x)]\, dx$$

$$\boxed{A = \int_0^\pi \operatorname{sen} x\, dx}$$

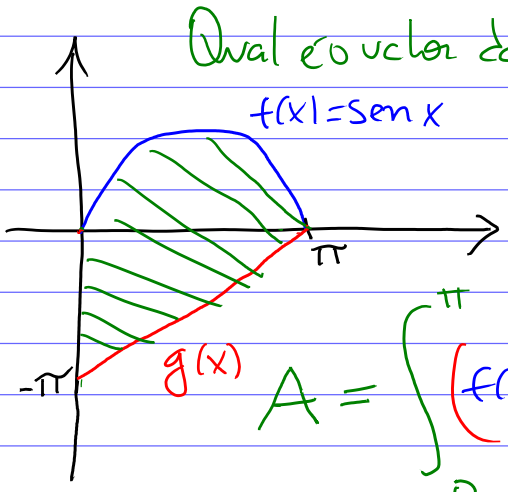
$$A = [-\cos x]\Big|_0^\pi = [-\cos\pi] - [-\cos 0]$$

TFC2

$$= [1] - [-1]$$

$$= 1 + 1 = 2$$

4) Qual é o valor de área verde..



$$A = \int_0^{\pi} \left(f(x) - g(x)\right) dx$$

Quem é g(x)?

$g(x) = ax + b$

$$\begin{cases} g(0) = a\cdot 0 + b = -\pi \\ g(\pi) = a\pi + b = 0 \end{cases}$$

$$\begin{cases} b = -\pi \quad (i) \\ a\pi + b = 0 \quad (ii) \end{cases}$$

$a\pi - \pi = 0$

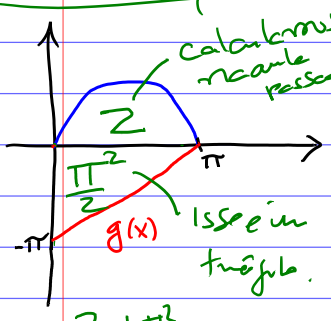
$a\pi = \pi$

$a = 1$

$g(x) = 1(x) - \pi$

$\boxed{g(x) = x - \pi}$

Decoreba



$2 + \frac{\pi^2}{2}$

$$A = \int_0^{\pi} \left(f(x) - g(x)\right) dx = \int_0^{\pi} \operatorname{sen} x - (x - \pi)\, dx$$

$$A = \int_0^{\pi} (\operatorname{sen} x - x + \pi)\, dx = \left[-\cos x - \frac{x^2}{2} + \pi x\right]_0^{\pi}$$

$$= \left[-\cos\pi - \frac{\pi^2}{2} + \pi^2\right] - \left[-\cos 0 - \frac{0}{2} + \pi 0\right]$$

$$= \left[1 + \frac{\pi^2}{2}\right] - [-1]$$

$$= 2 + \frac{\pi^2}{2}$$

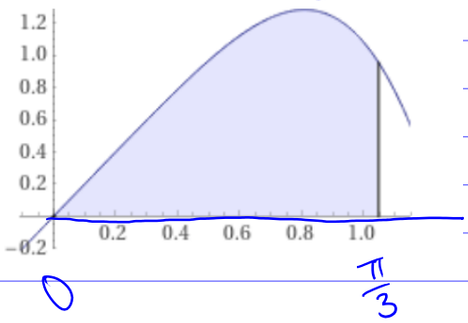
$$\int_a^b c\,dx = c(b-a)$$

↑ Propriedade

$$\int_a^b c\,dx = cx\Big|_a^b = c(b-a) \leftarrow \text{TFC2}$$

Calcule a área.

$f(x) = 2x\cos(x^2)$



$g(x) = 0$

0 $\qquad \frac{\pi}{3}$

$$A = \int_0^{\frac{\pi}{3}} \left[f(x) - g(x) \right] dx = \int_0^{\frac{\pi}{3}} \left[f(x) - 0 \right] dx$$

$$A = \int_0^{\frac{\pi}{3}} \underbrace{\left(2x\cos(x^2) \right)}_{u} \underbrace{dx}_{du}$$

Substituição

Diferencial

$$du = \frac{d}{dx} u \, dx$$

$$u = x^2 \quad \therefore \quad \frac{du}{dx} = 2x$$

$$\therefore \quad du = 2x\,dx$$

Quando $x = 0$, $u = 0^2 = 0$

e $x = \frac{\pi}{3}$, $u = \left(\frac{\pi}{3}\right)^2 = \frac{\pi^2}{9}$

$$A = \int_0^{\frac{\pi^2}{9}} \cos(u)\, du$$

$$A = \operatorname{sen} u \Big|_0^{\frac{\pi^2}{9}} = \operatorname{sen}\left(\frac{\pi^2}{9}\right) \approx 0.89$$

WolframAlpha computational intelligence.

int(2*x*cos(x^2),x=0..pi/3)

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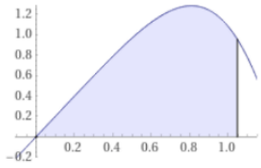
Definite integral: More digits | Step-by-step solution

$$\int_0^{\frac{\pi}{3}} 2x\cos(x^2)\,dx = \sin\left(\frac{\pi^2}{9}\right) \approx 0.88967$$

Visual representation of the integral:



Indefinite integral: Step-by-step solution