1.6 CALCUL D’AIRE

cours 6

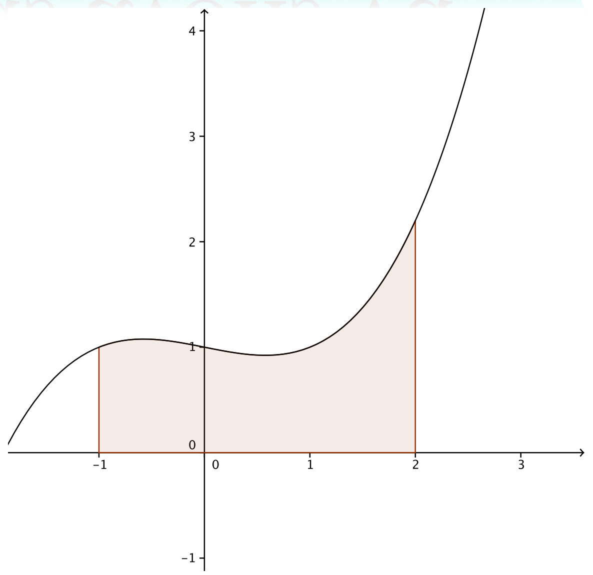
Au dernier cours, nous avons vu

Au dernier cours, nous avons vu

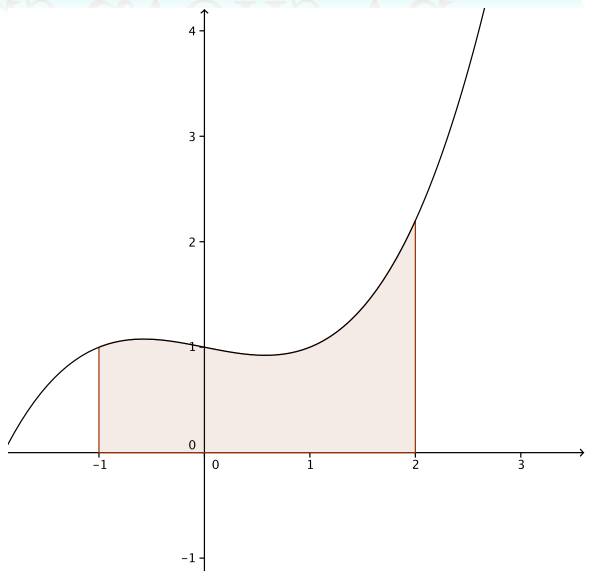
✓ Intégrale définie

Au dernier cours, nous avons vu

✓ Intégrale définie



Au dernier cours, nous avons vu

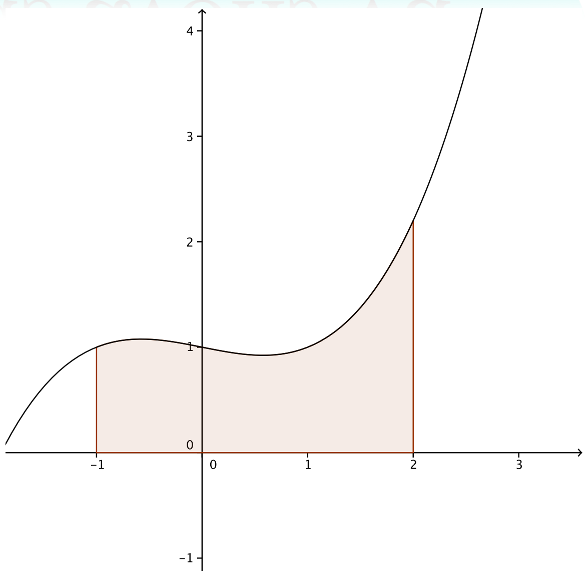


✓ Intégrale définie

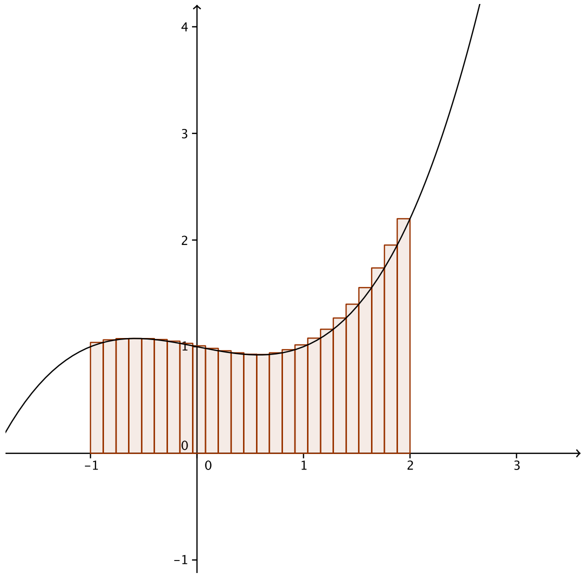
✓ Somme de Riemann

Au dernier cours, nous avons vu

✓ Intégrale définie

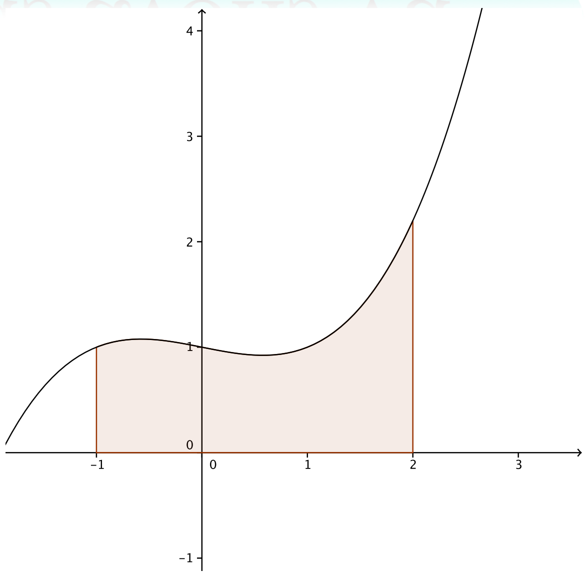


✓ Somme de Riemann



Au dernier cours, nous avons vu

✓ Intégrale définie



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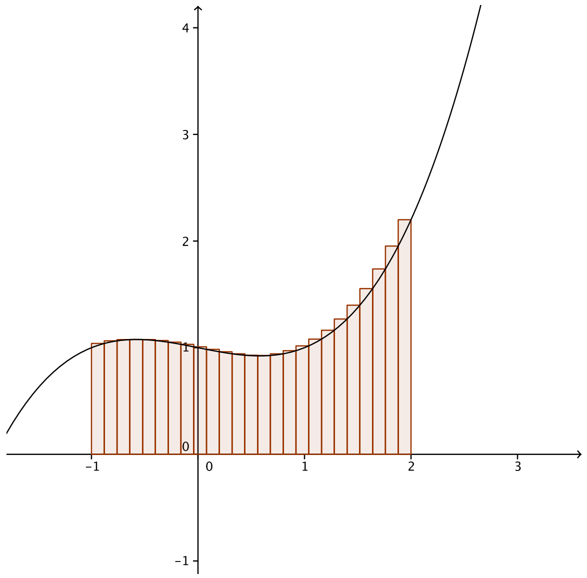
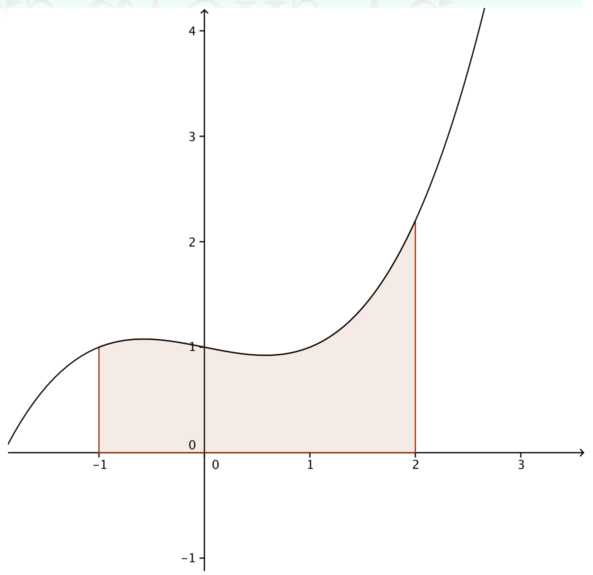


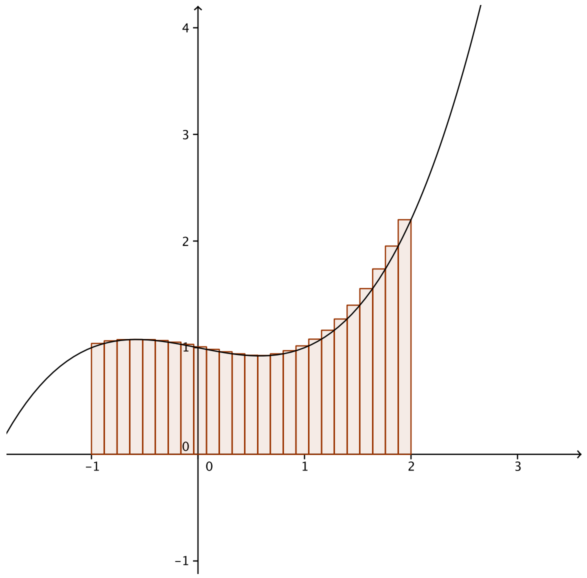
✓ Théorème fondamental du calcul

Au dernier cours, nous avons vu

✓ Intégrale définie



✓ Somme de Riemann



✓ Théorème fondamental du calcul

$$\int_a^b f(x)\ dx = F(b) - F(a)$$

Aujourd’hui, nous allons voir

Aujourd’hui, nous allons voir

✓ Intégrale définie avec changement de variable

Aujourd’hui, nous allons voir

- ✓ Intégrale définie avec changement de variable
- ✓ Calcul d’aire

Aujourd’hui, nous allons voir

- ✓ Intégrale définie avec changement de variable
- ✓ Calcul d’aire
- ✓ Aire entre 2 courbes

Exemple

$$\int_{\frac{\pi}{12}}^{\frac{3\pi}{12}} \sin(3x)\ dx$$

Exemple

$$\int_{\frac{\pi}{12}}^{\frac{3\pi}{12}} \sin(3x)\ dx \qquad\qquad u = 3x$$

Exemple

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$$\int_{?}^{?} \frac{\sin u}{3}\ du$$

Exemple

$$\int_{\frac{\pi}{12}}^{\frac{3\pi}{12}} \sin(3x)\ dx \qquad u = 3x \quad du = 3dx \quad dx = \frac{du}{3}$$

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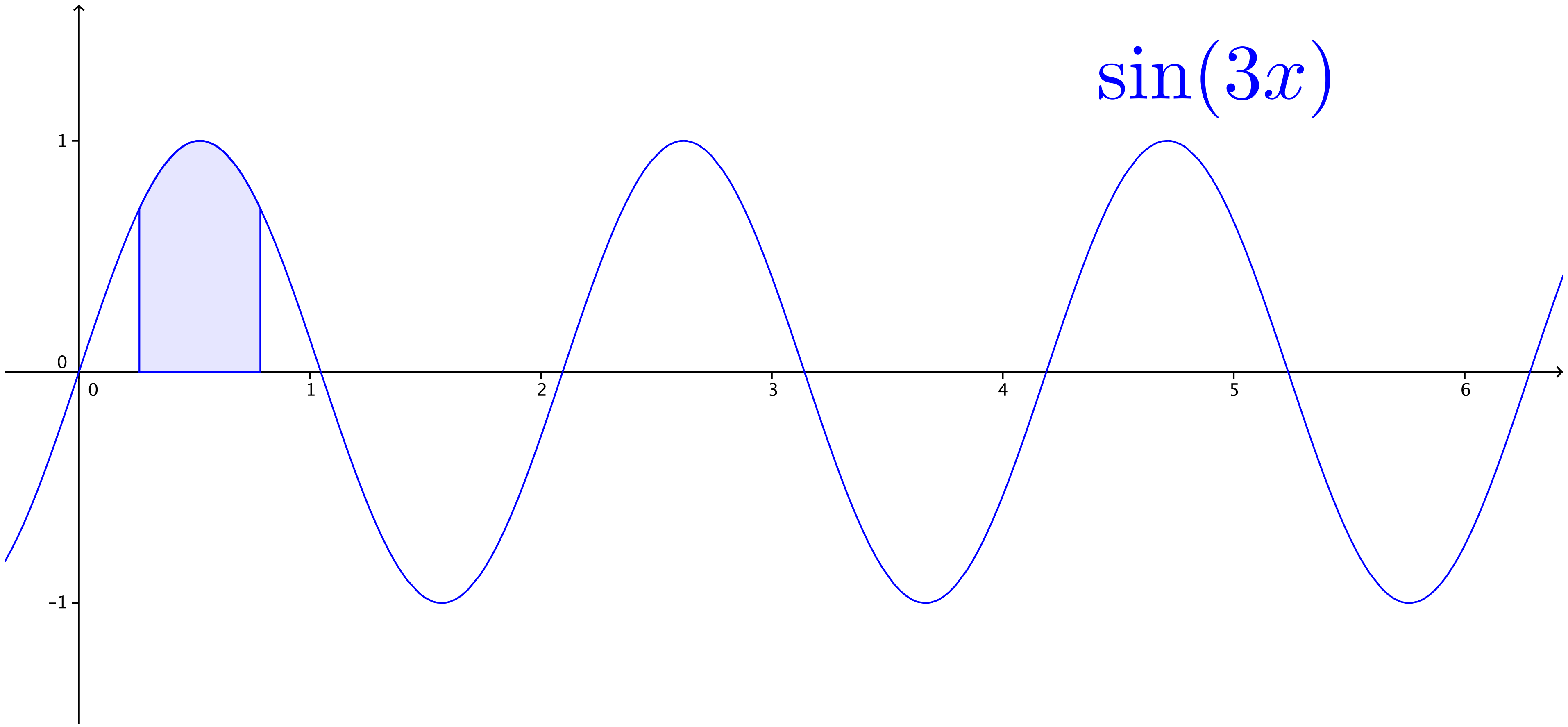

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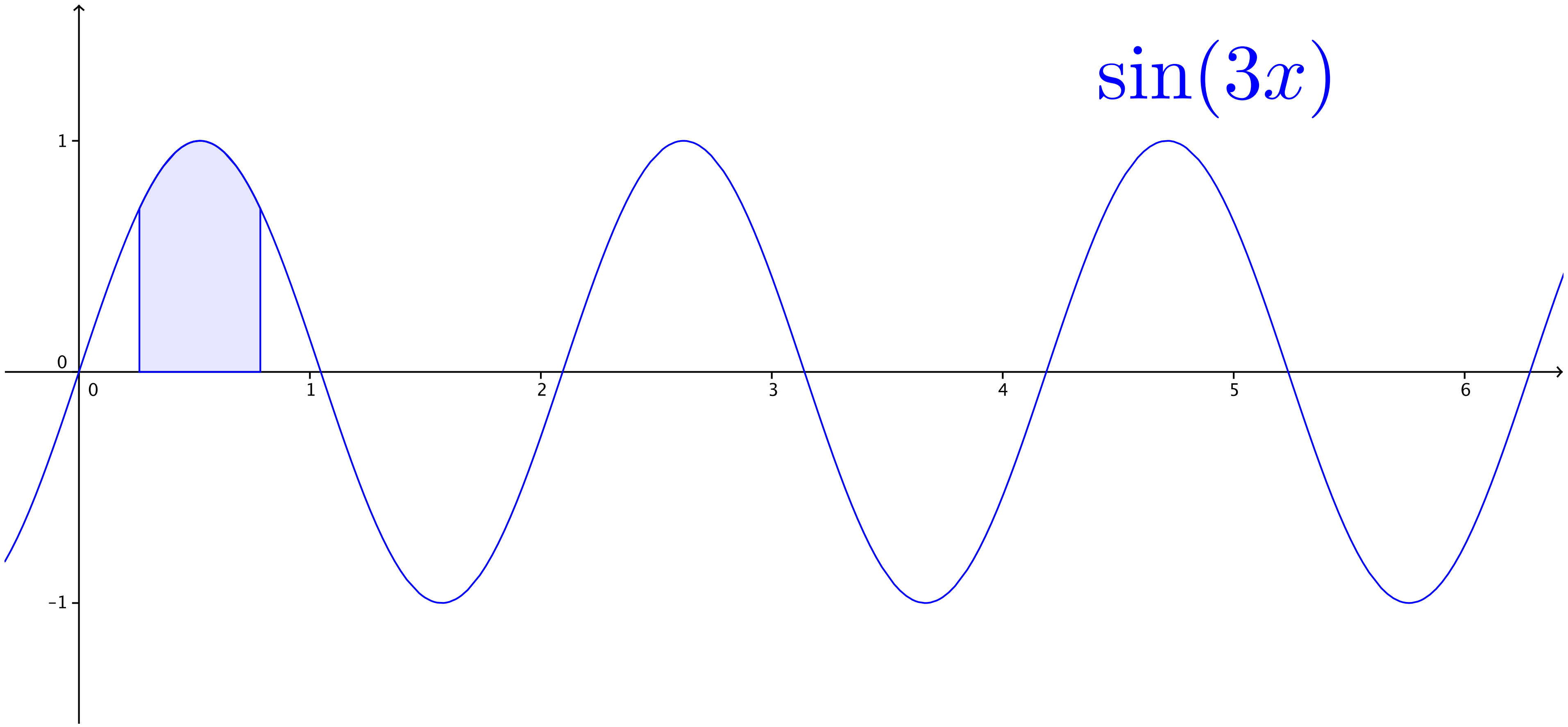

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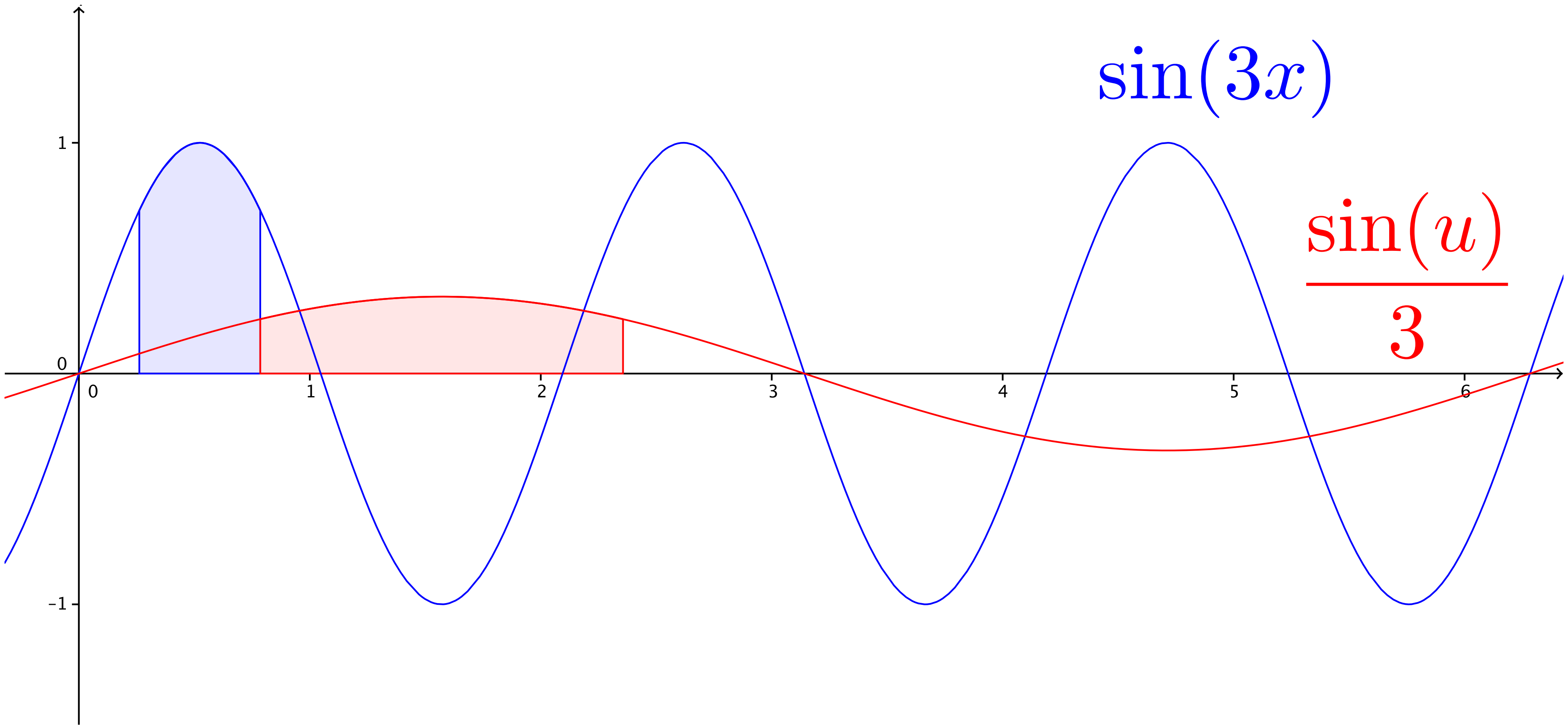

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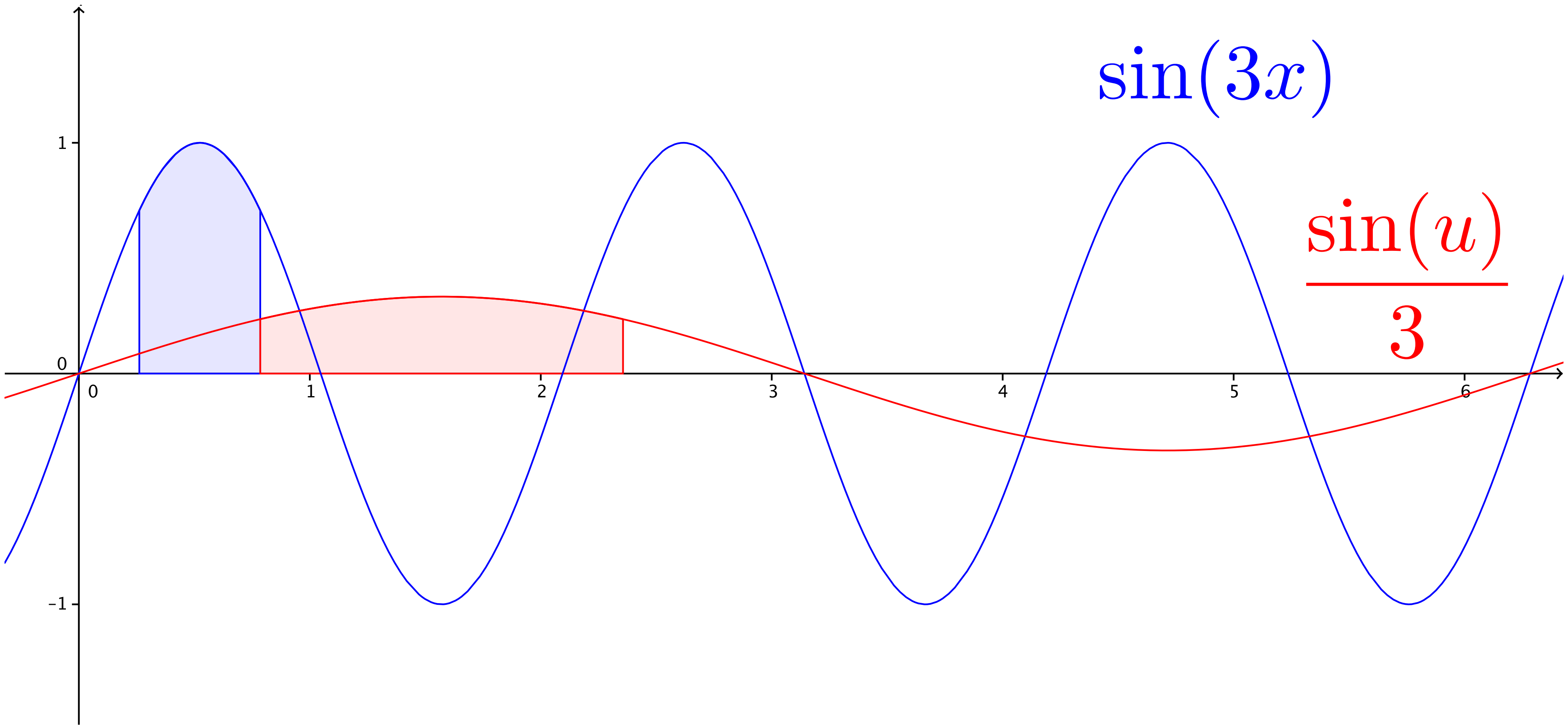

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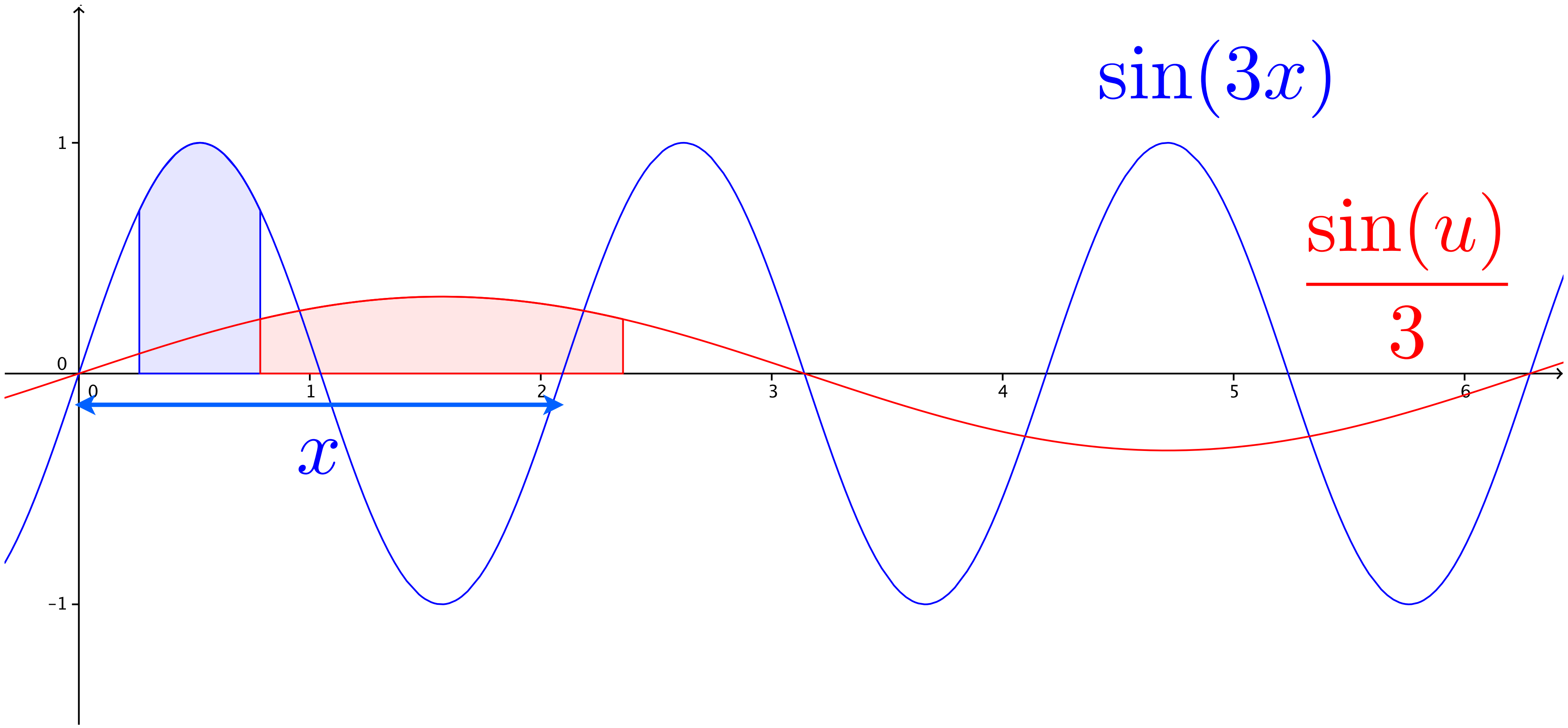

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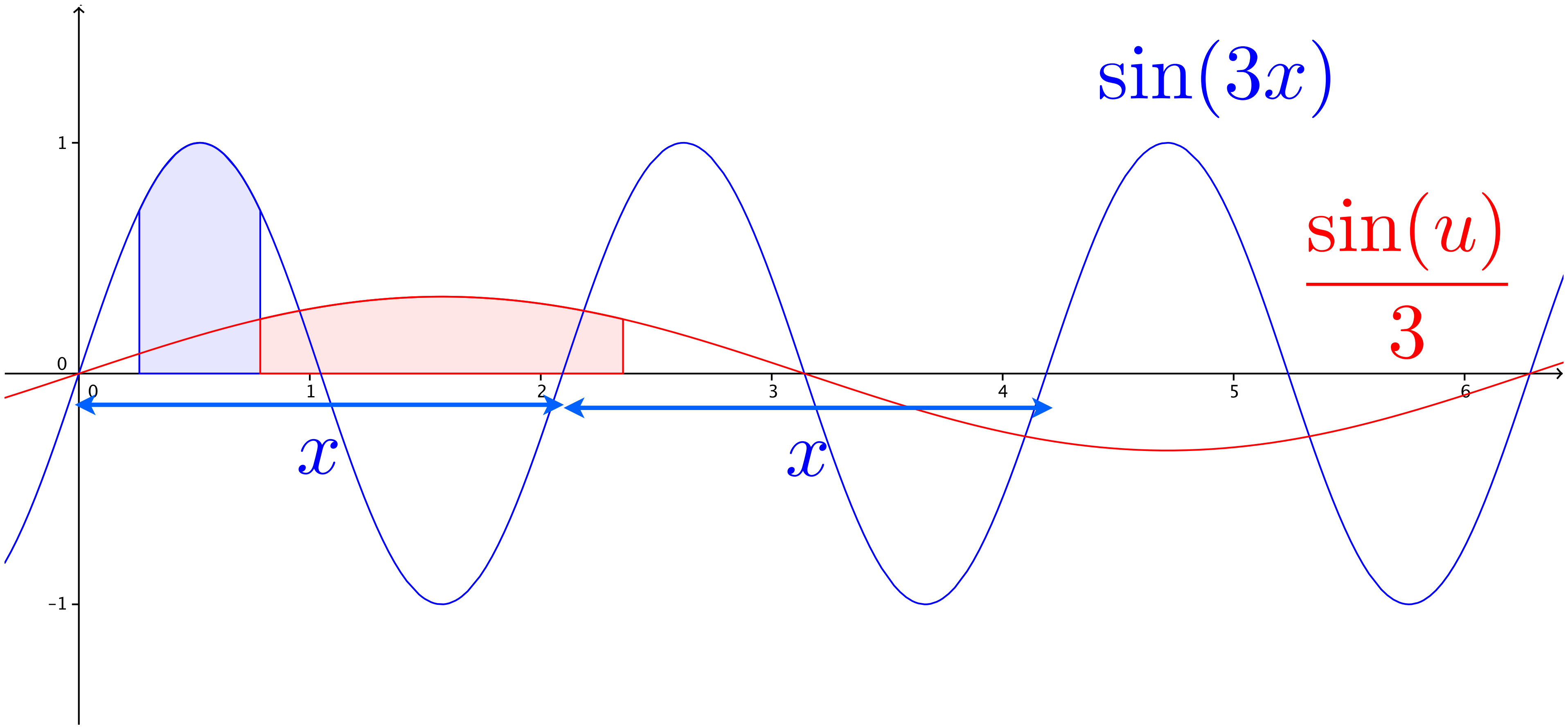

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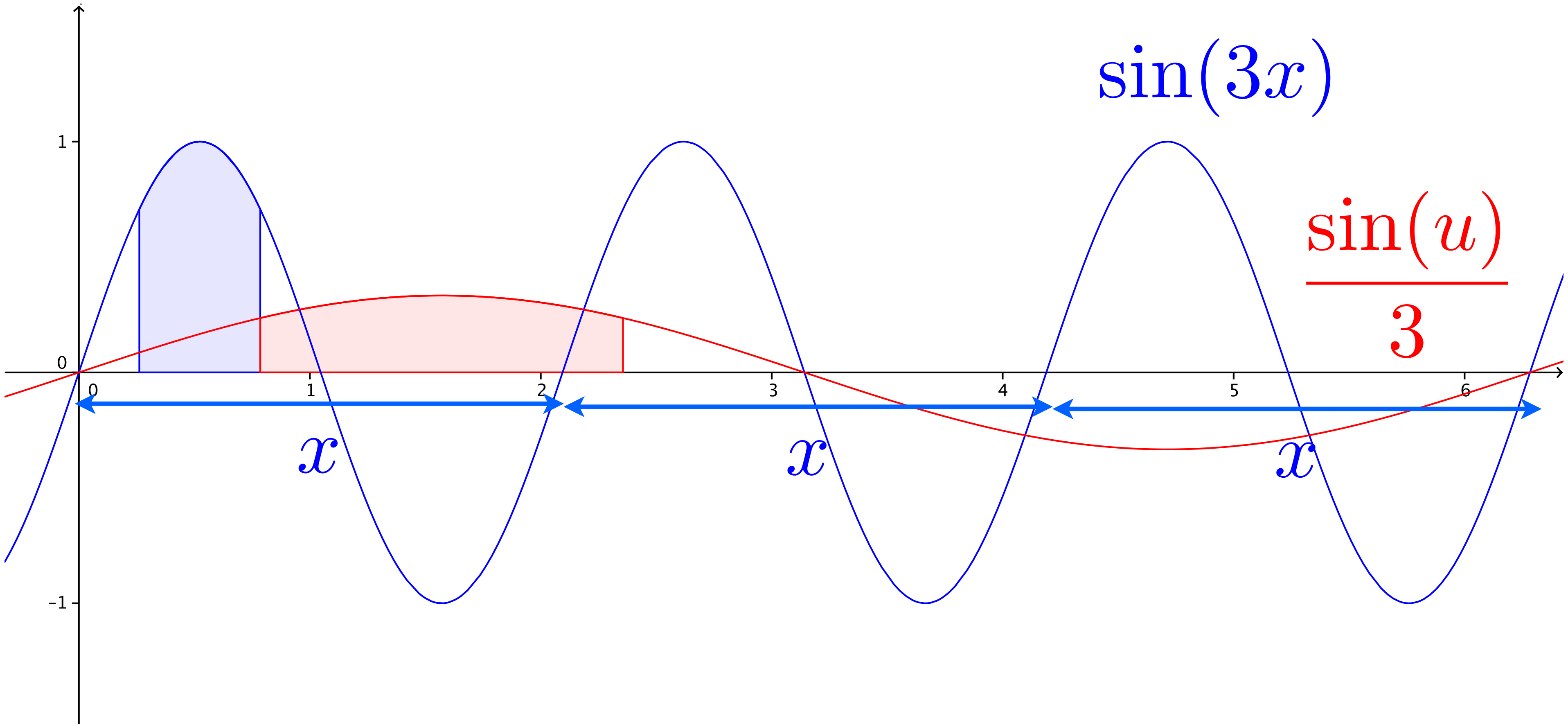

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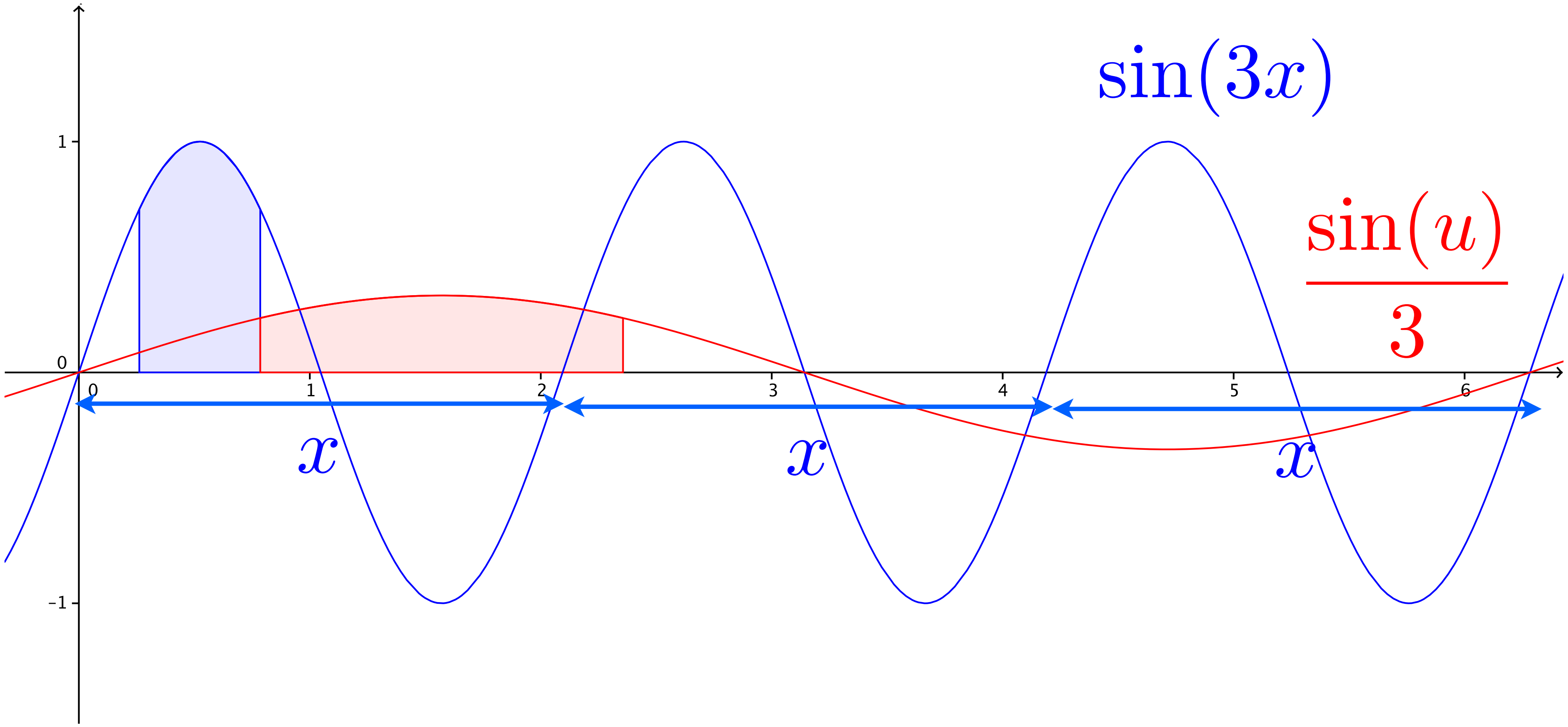

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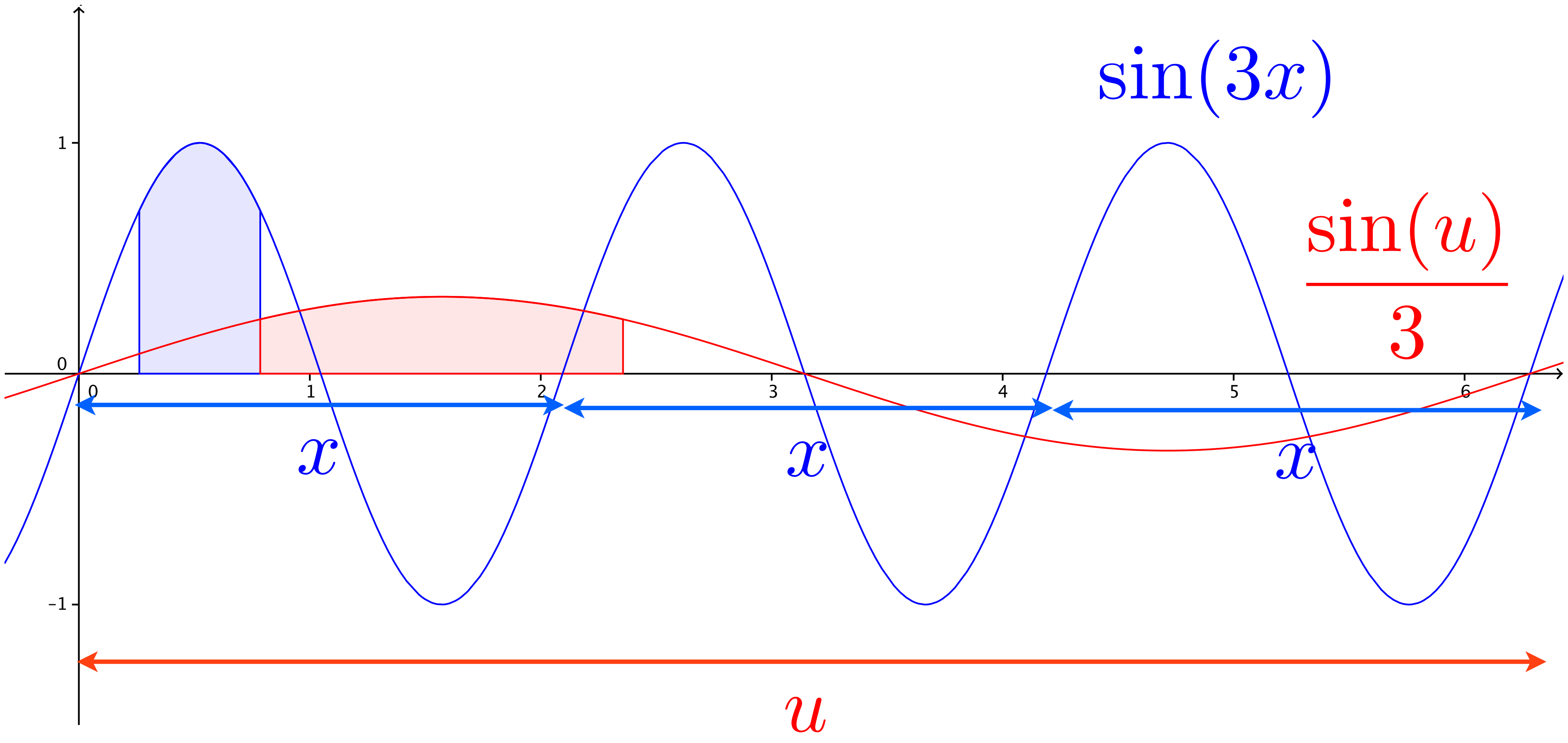

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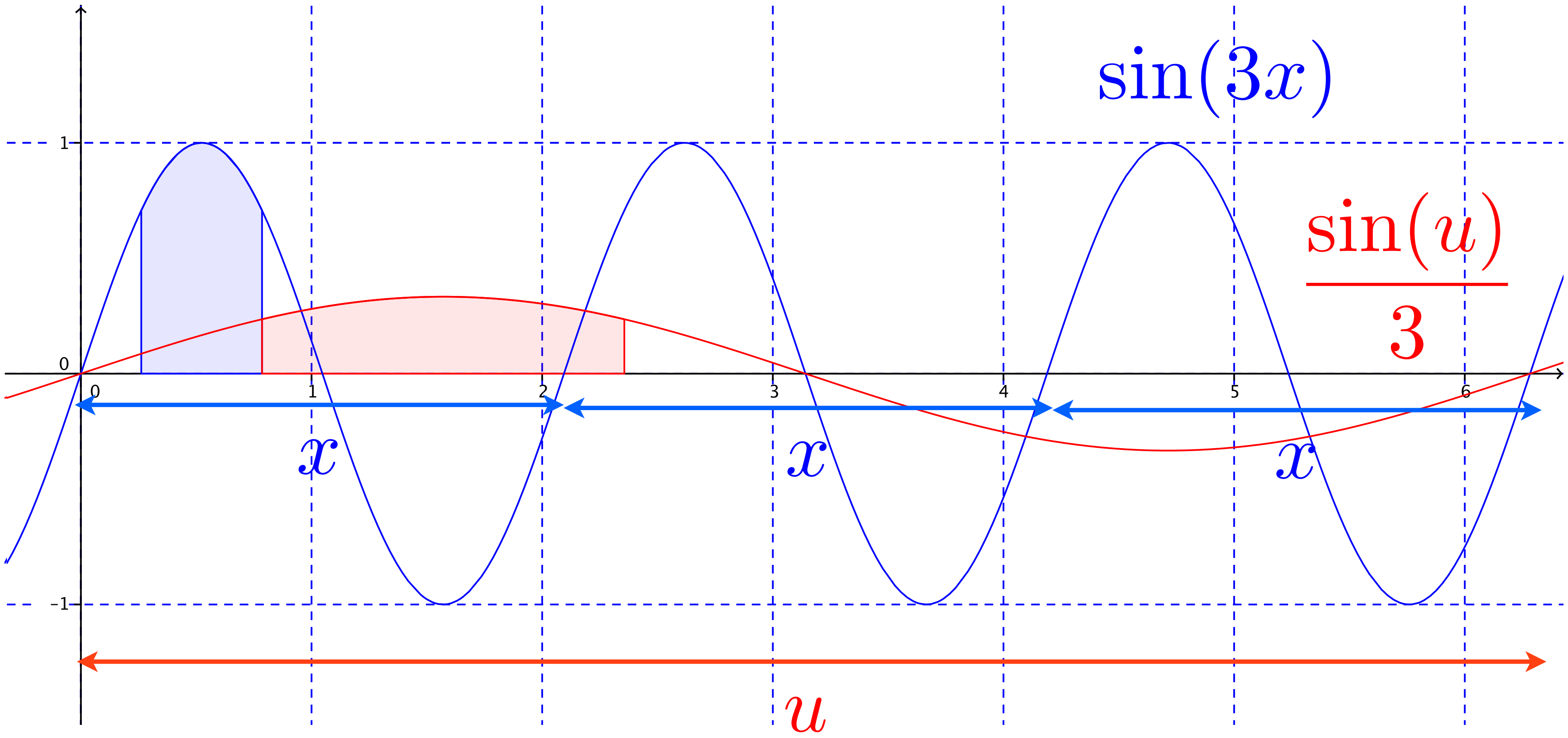

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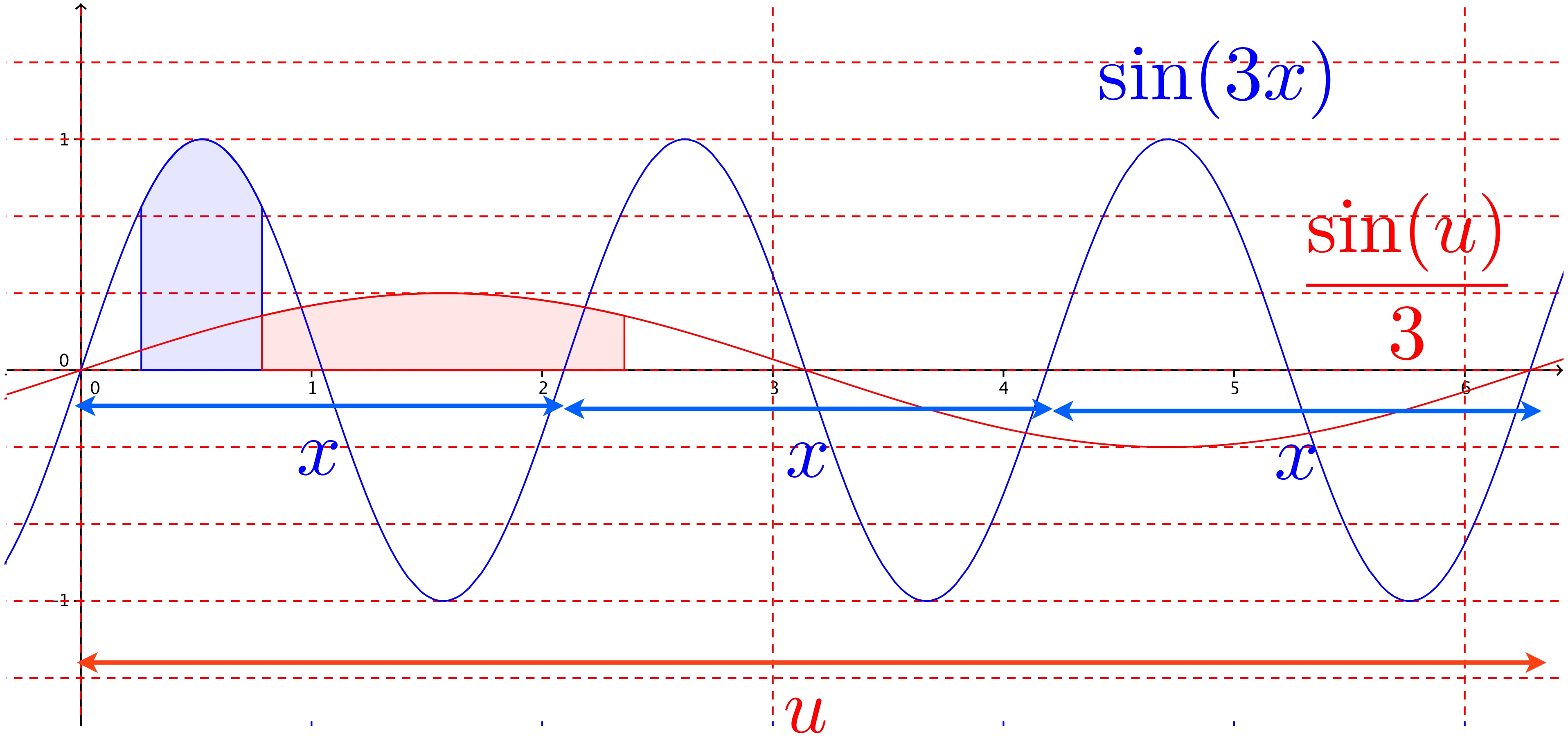

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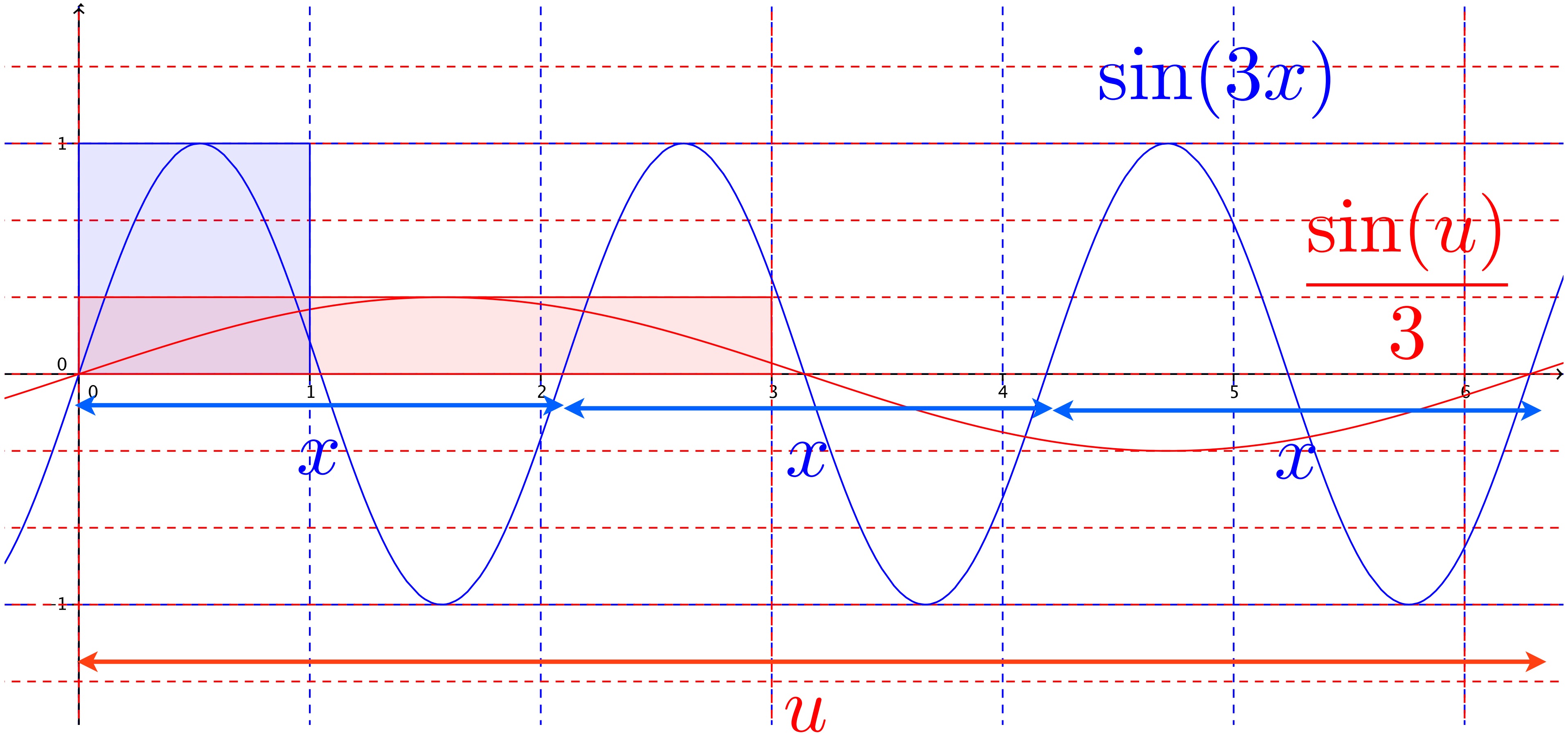

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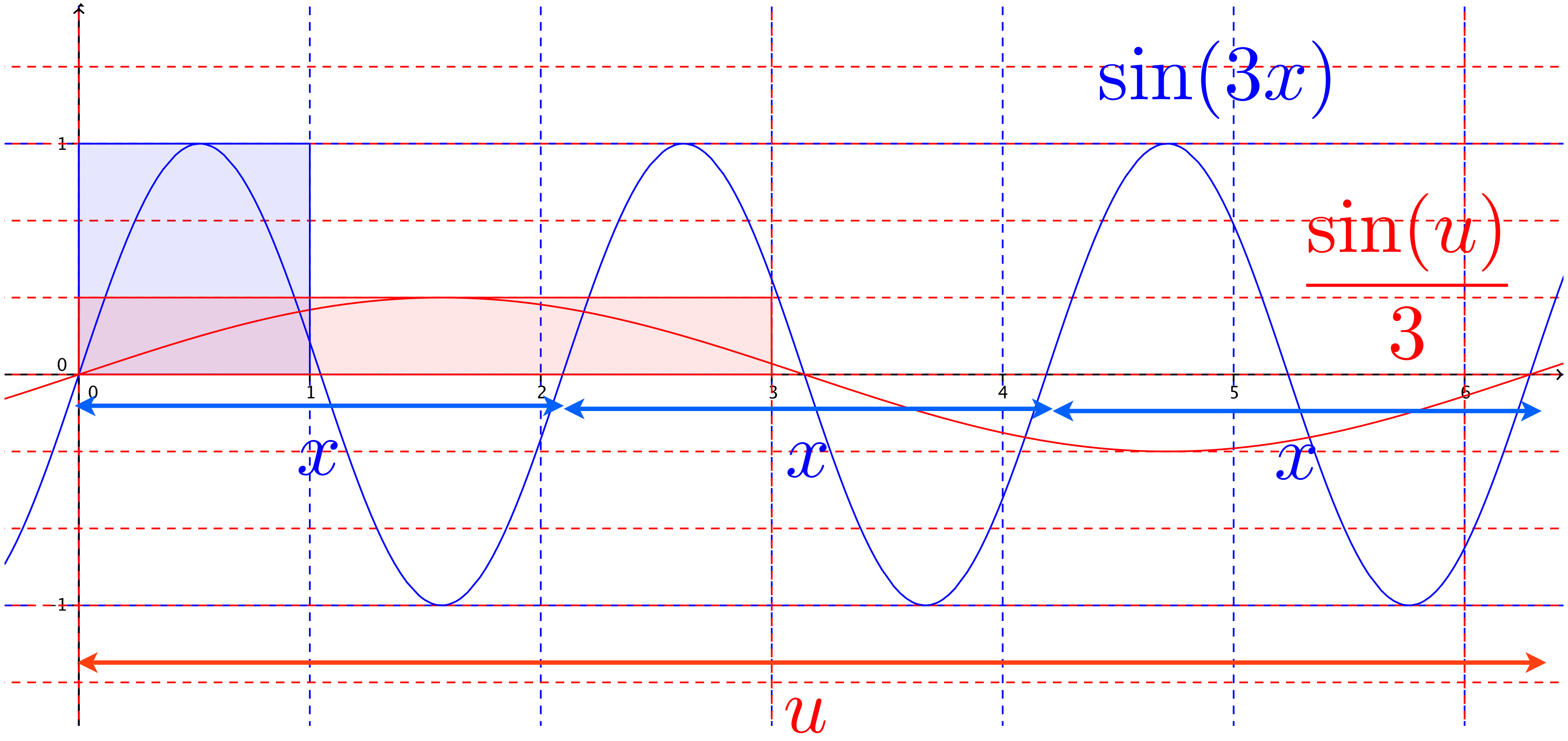

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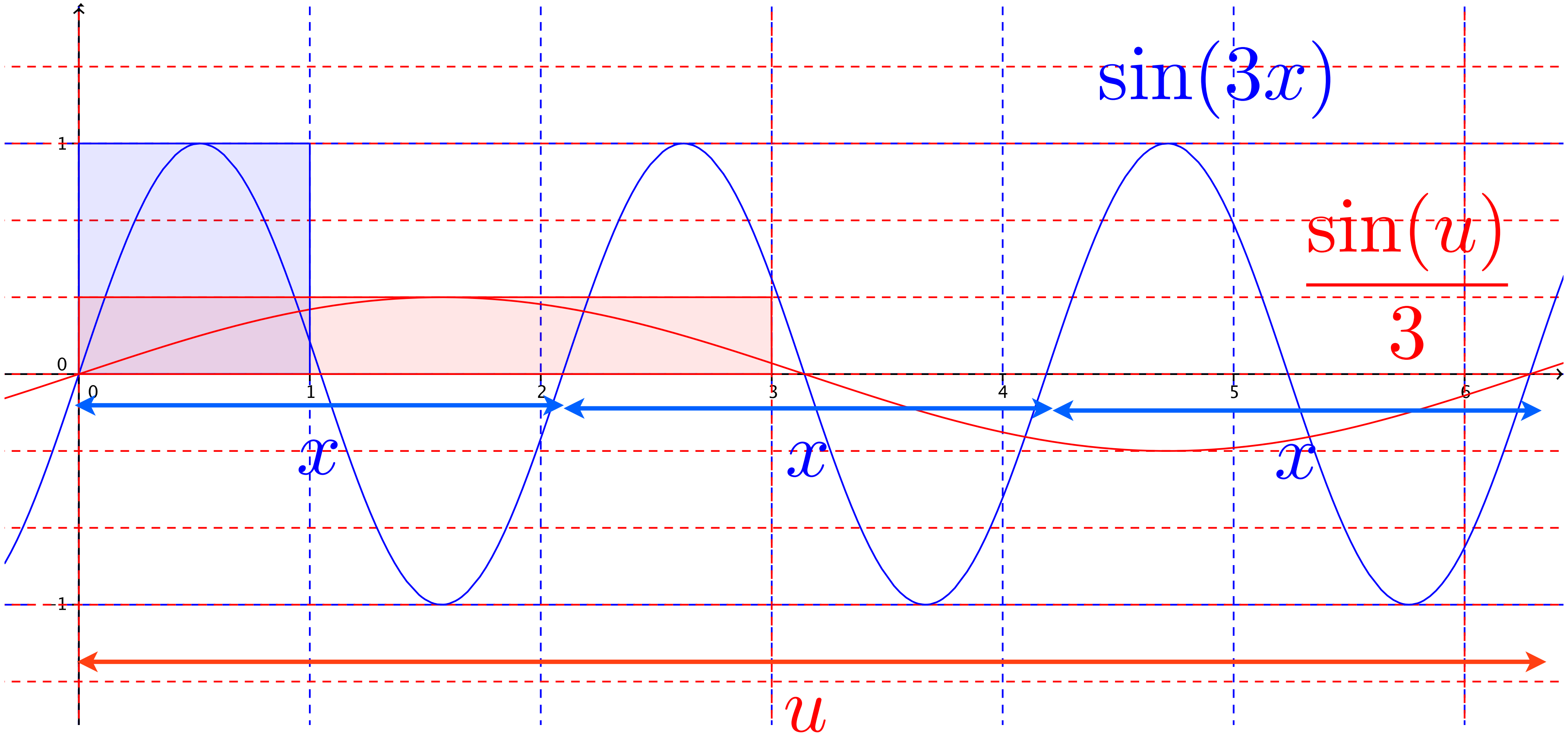
$$x = \frac{\pi}{12}$$

$$u = 3\frac{\pi}{12}$$



Exemple

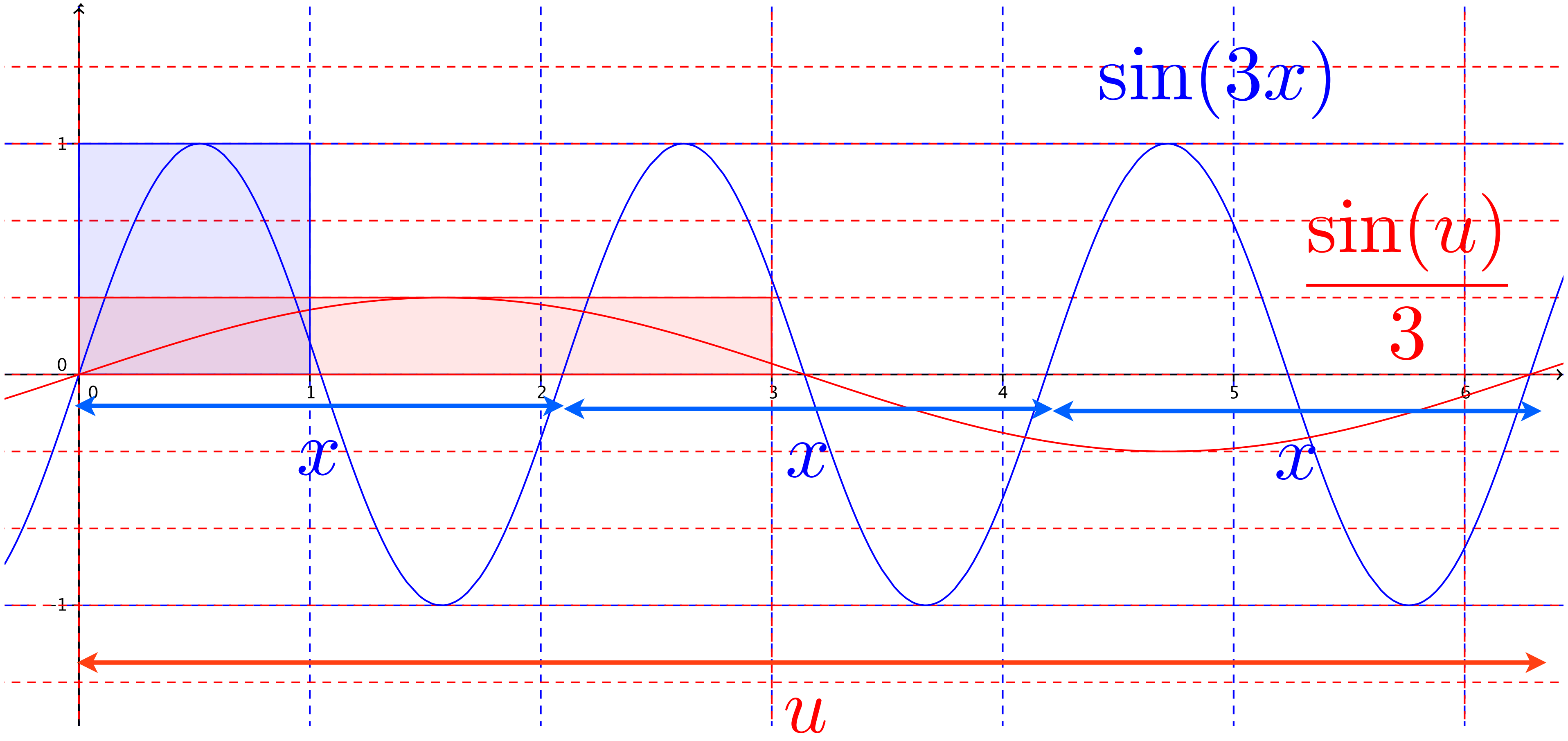
$$\int_{\frac{\pi}{12}}^{\frac{3\pi}{12}} \sin(3x)\ dx$$

$$u = 3x \qquad du = 3dx \qquad dx = \frac{du}{3}$$

$$\int_{?}^{?} \frac{\sin u}{3}\ du$$

$$x = \frac{\pi}{12}$$

$$u = 3\frac{\pi}{12} = \frac{\pi}{4}$$



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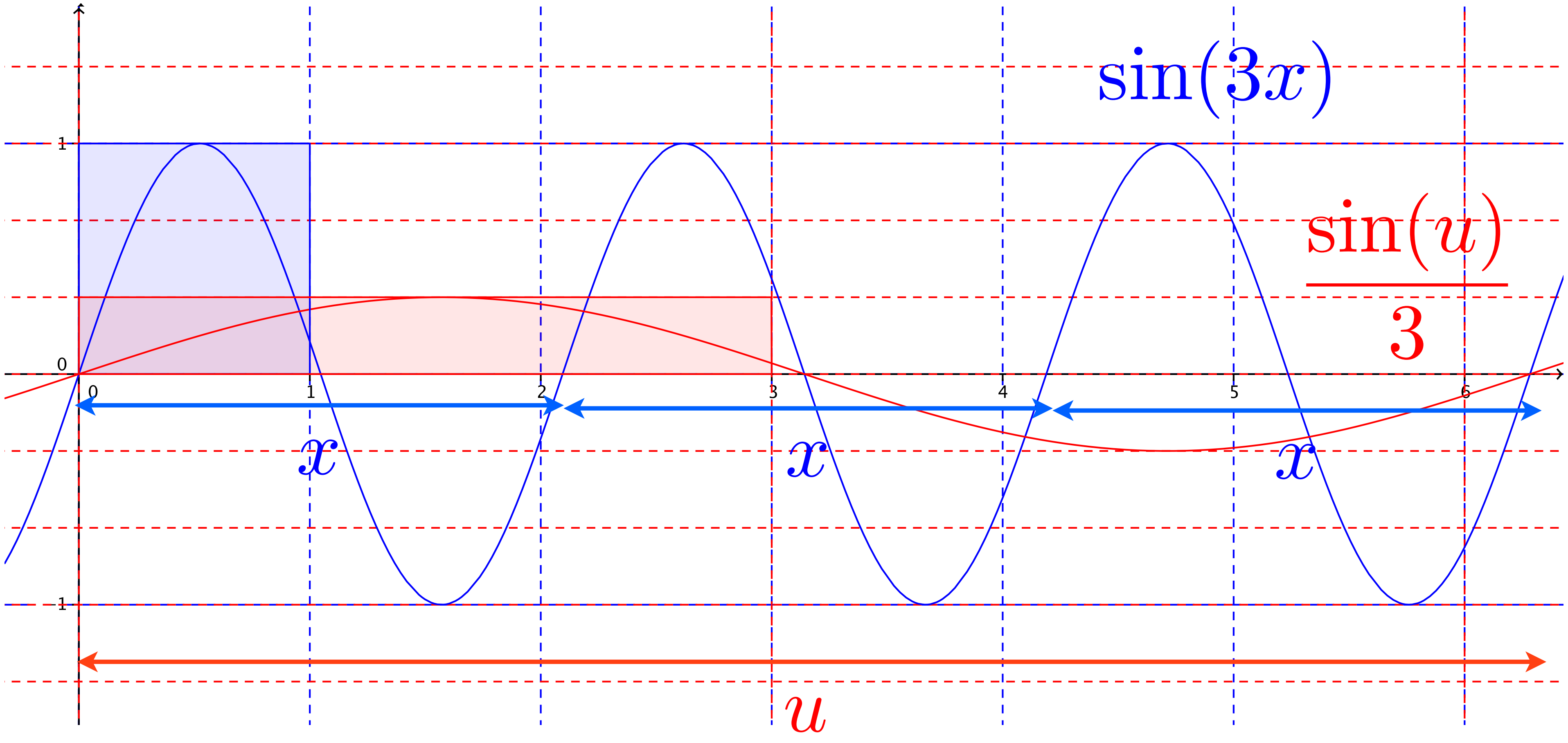

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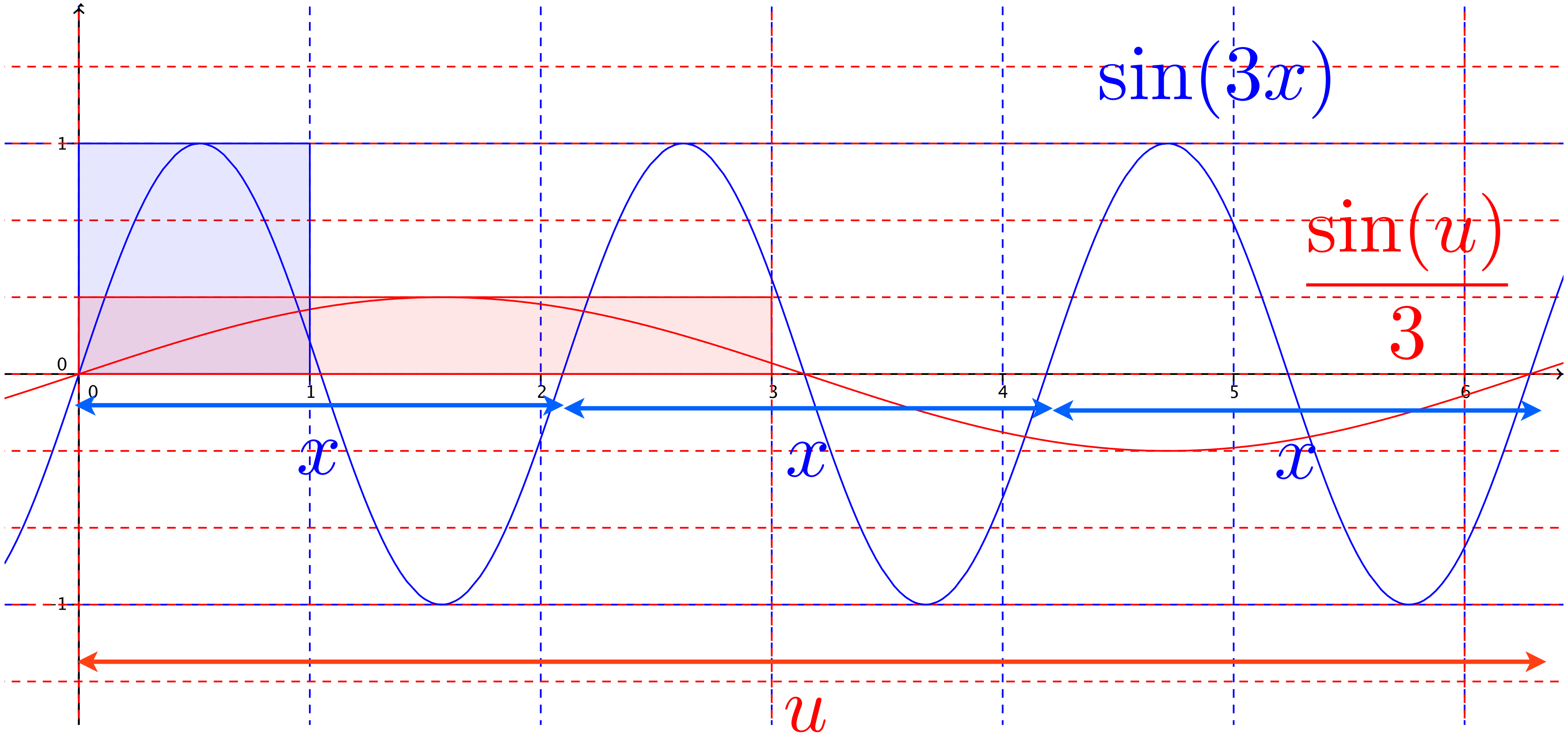

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Exemple

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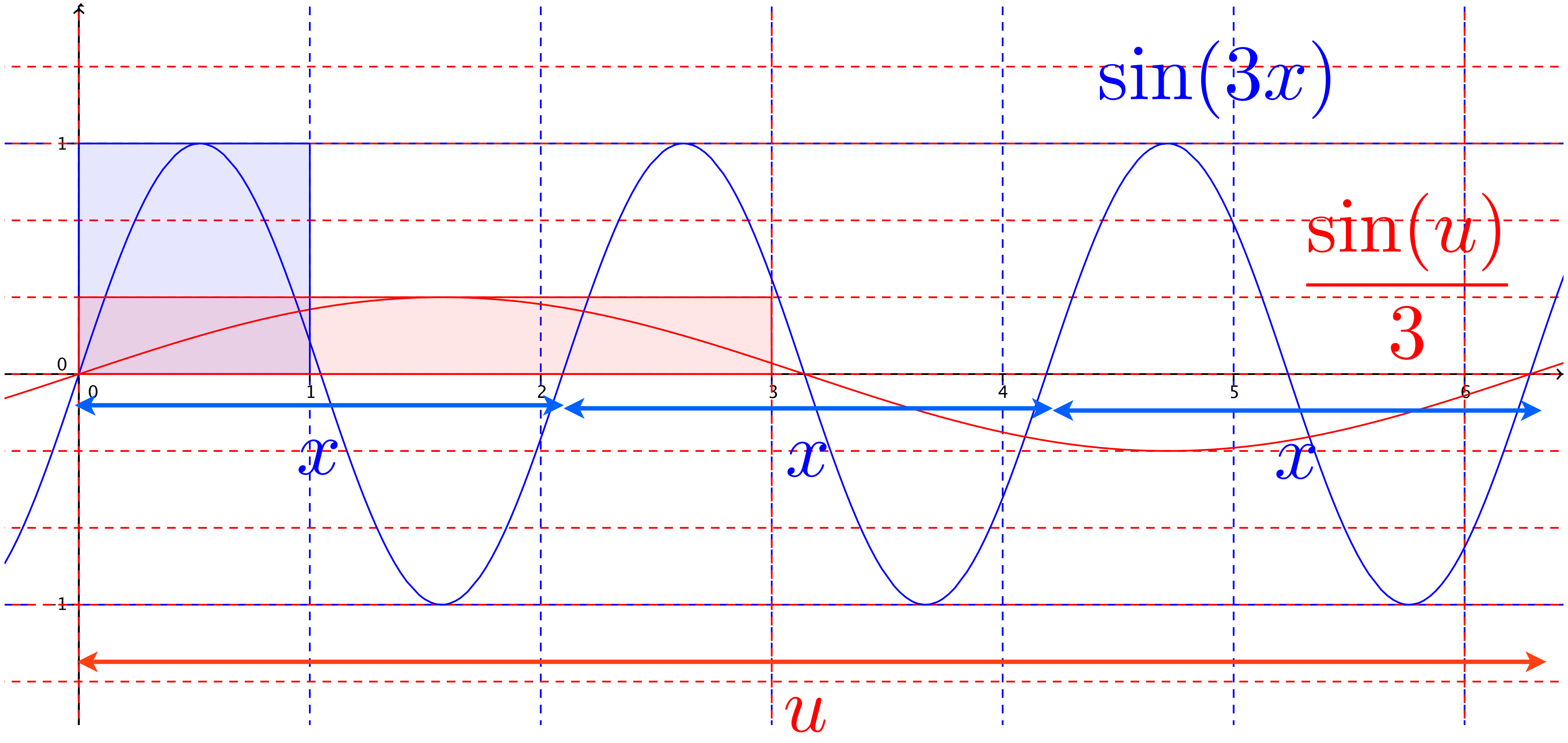

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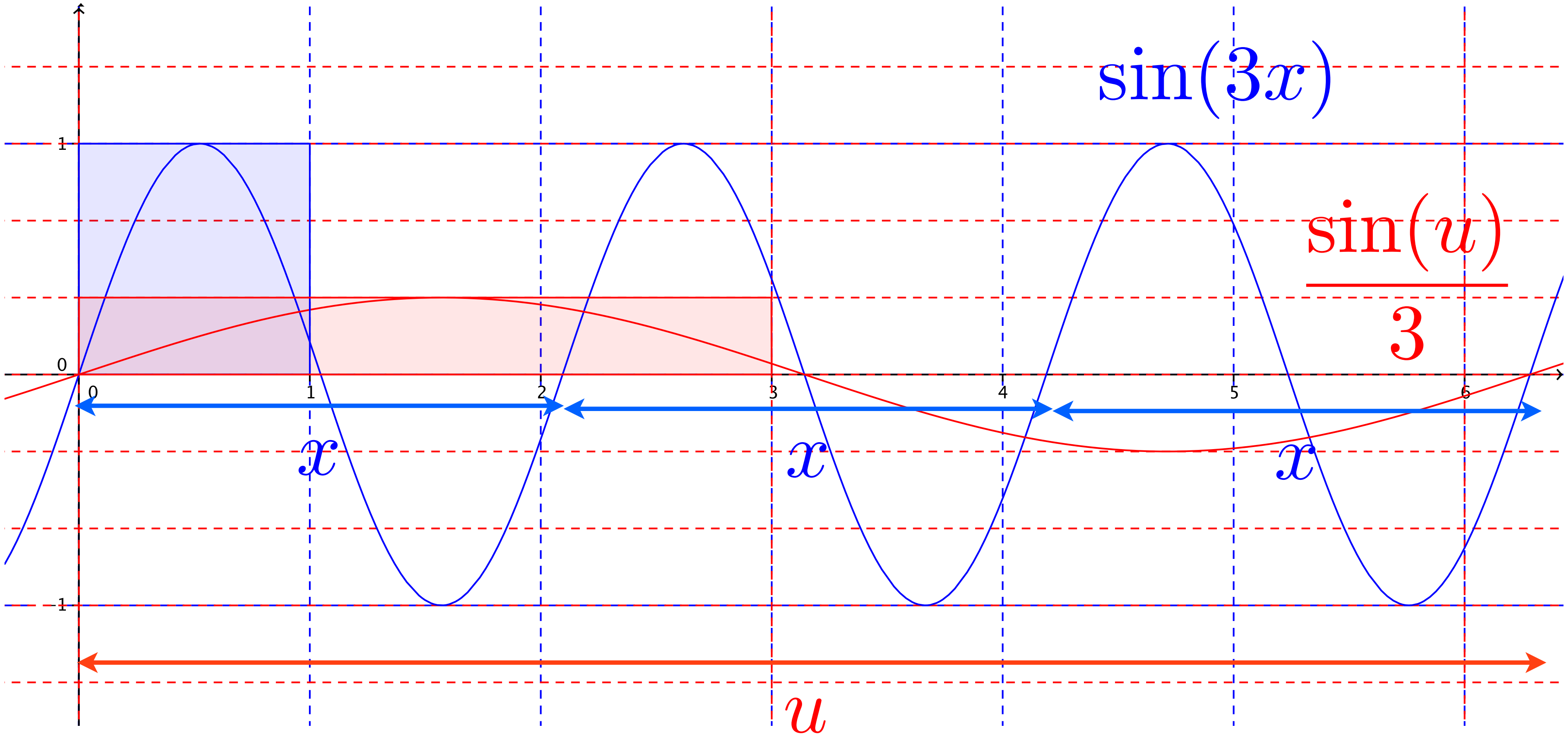
Exemple

$$\int_{\frac{\pi}{12}}^{\frac{3\pi}{12}} \sin(3x)\ dx$$

$u = 3x \quad du = 3dx \quad dx = \dfrac{du}{3}$

$$\int_{\frac{\pi}{4}}^{\frac{3\pi}{4}} \frac{\sin u}{3}\ du$$



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Exemple

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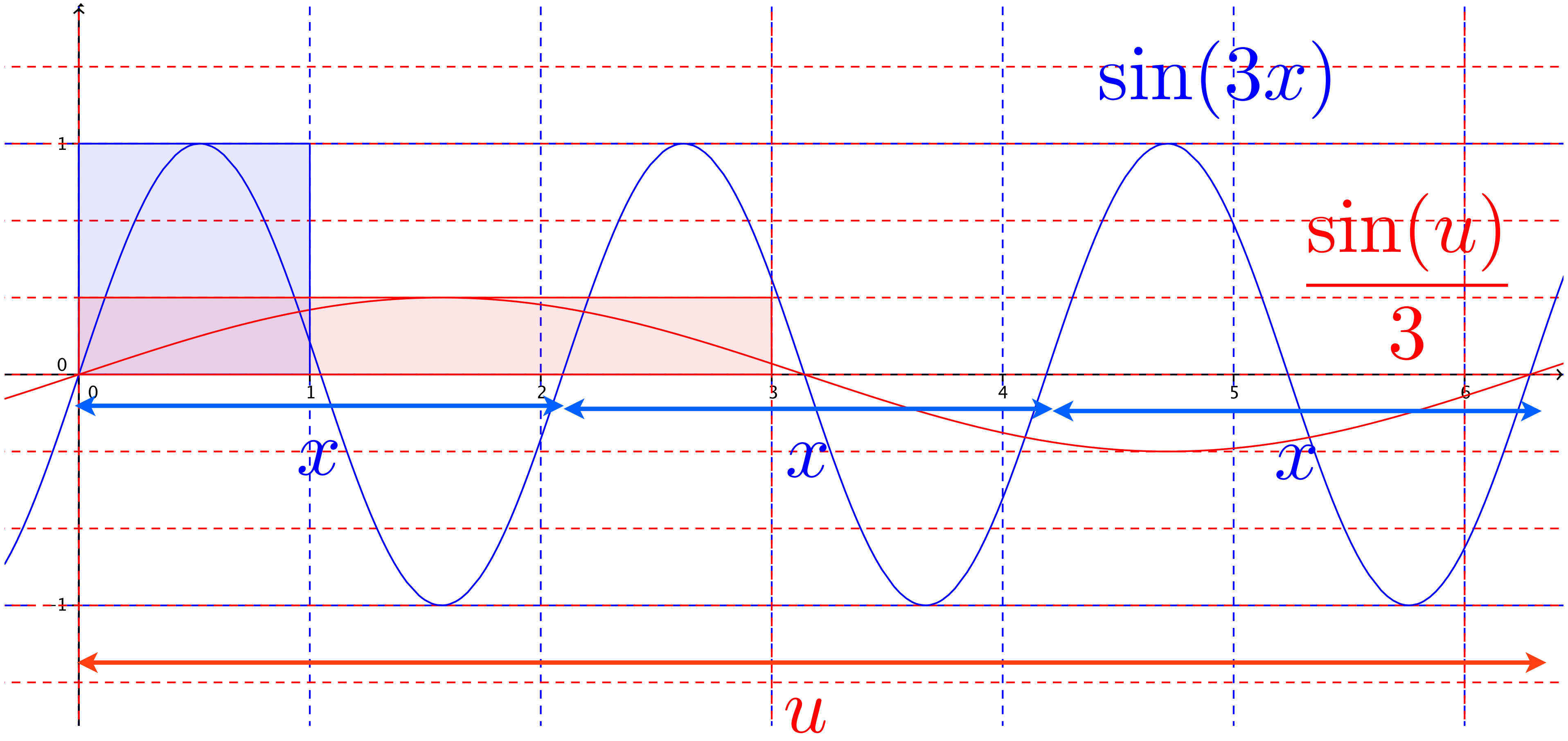
$$\int_{\frac{\pi}{4}}^{\frac{3\pi}{4}} \frac{\sin u}{3}\ du = -\frac{\cos u}{3}\Bigg|_{\frac{\pi}{4}}^{\frac{3\pi}{4}}$$



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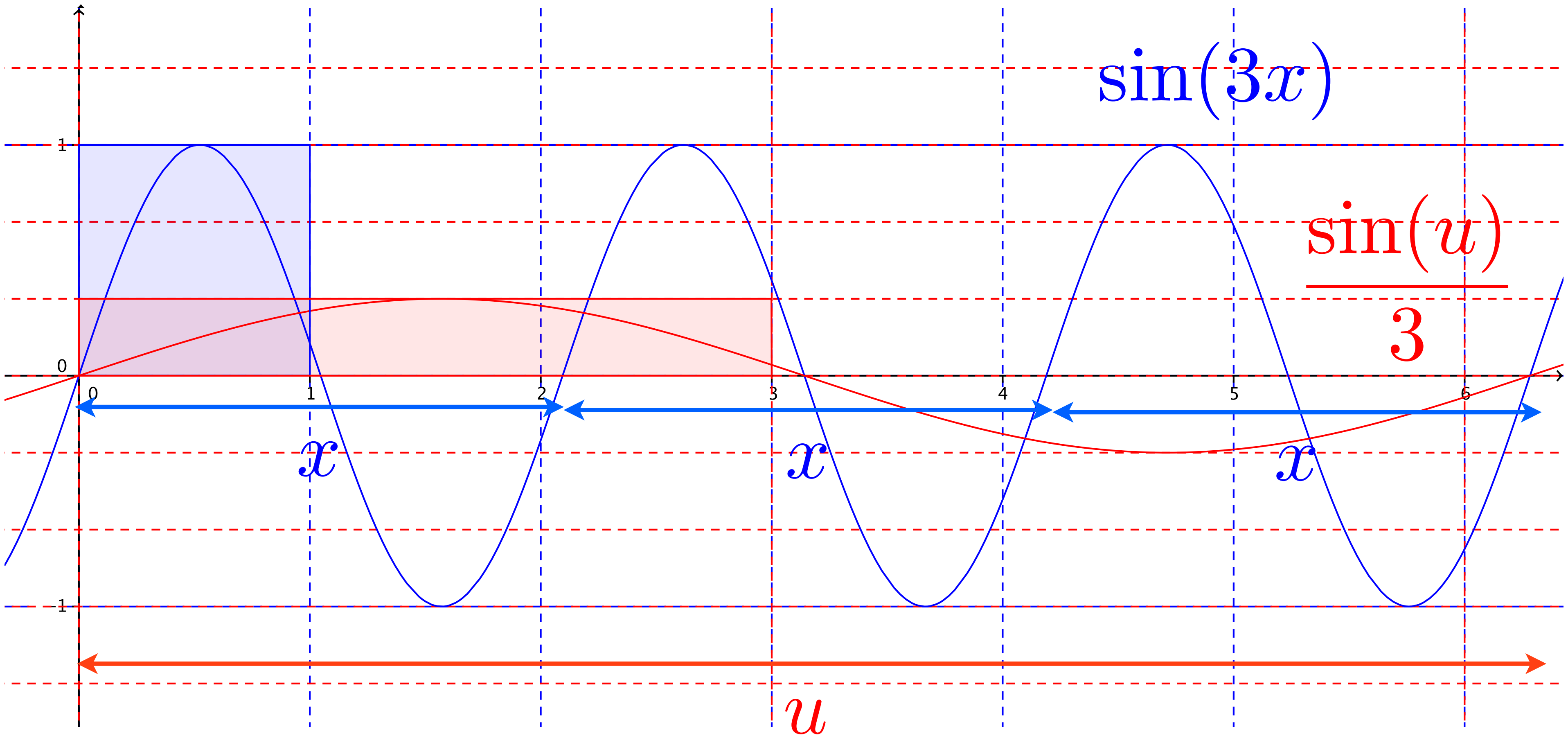

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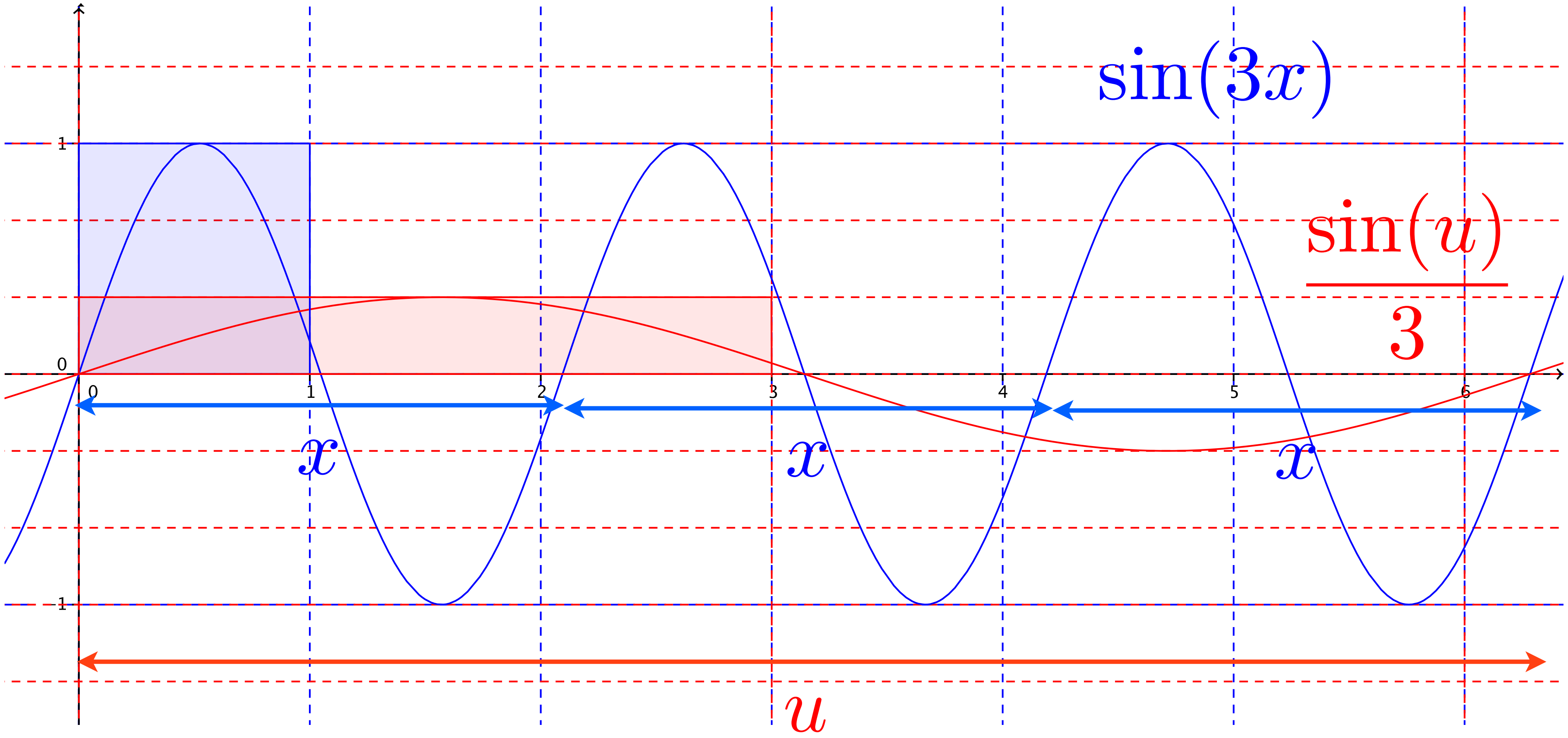

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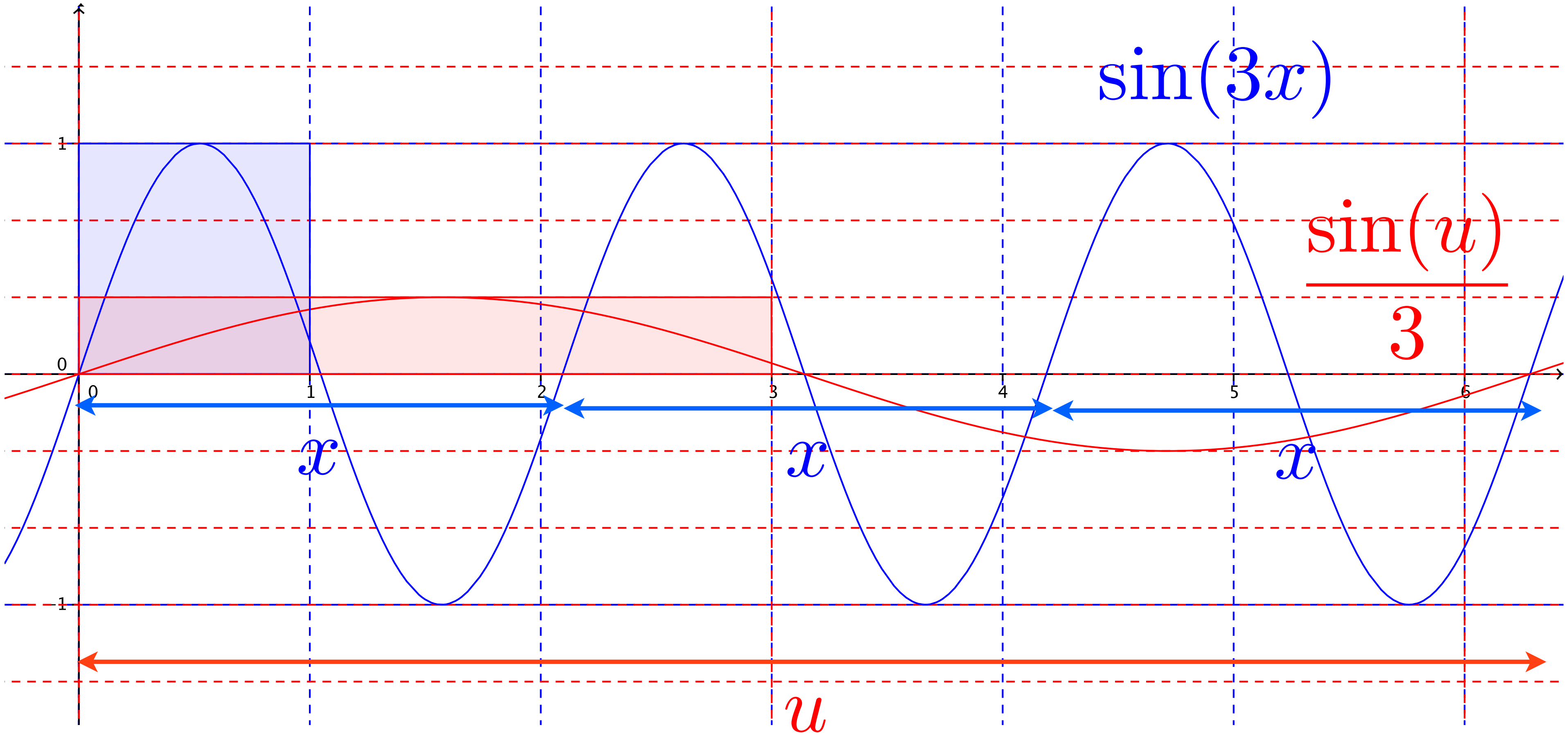
$$= 2\frac{\frac{\sqrt{2}}{2}}{3}$$

$$x = \frac{\pi}{12}$$



$$u = 3\frac{\pi}{12} = \frac{\pi}{4}$$

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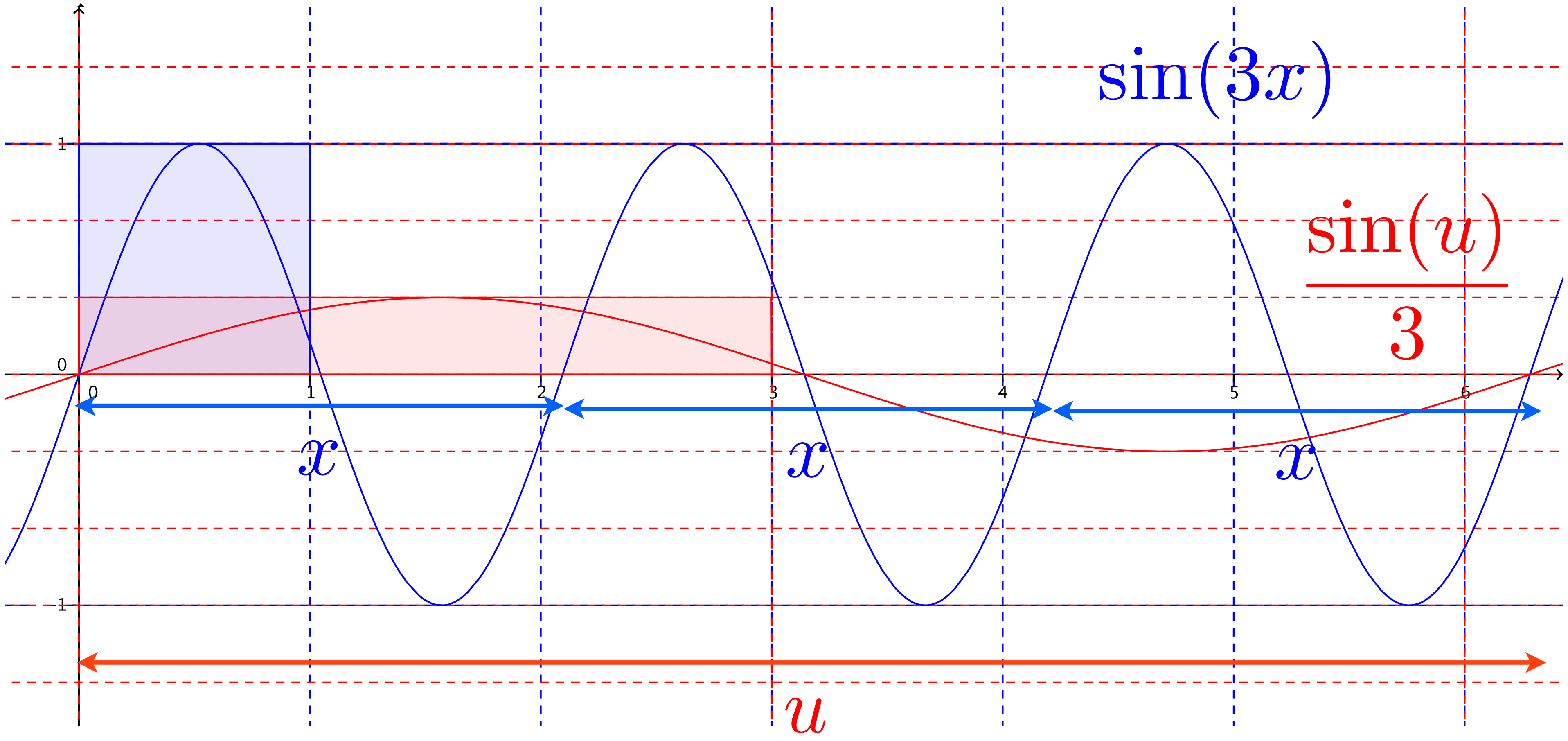
$$= 2\frac{\frac{\sqrt{2}}{2}}{3} = \frac{\sqrt{2}}{3}$$



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Exemple

$$\int_{\frac{\pi}{12}}^{\frac{3\pi}{12}} \sin(3x)\ dx \qquad u = 3x \quad du = 3dx \quad dx = \frac{du}{3}$$

$$\int_{?}^{?} \frac{\sin u}{3}\ du$$

$$= \frac{\sqrt{2}}{3}$$

Exemple $\int_{\frac{\pi}{12}}^{\frac{3\pi}{12}} \sin(3x)\ dx$ $u = 3x \quad du = 3dx \quad dx = \frac{du}{3}$

$$\int_{?}^{?} \frac{\sin u}{3}\ du$$

Prise 2

$$= \frac{\sqrt{2}}{3}$$

Exemple

$$\int_{\frac{\pi}{12}}^{\frac{3\pi}{12}} \sin(3x)\ dx \qquad u = 3x \quad du = 3dx \quad dx = \frac{du}{3}$$

$$\int_{?}^{?} \frac{\sin u}{3}\ du = -\frac{\cos u}{3}\Big|_{?}^{?}$$

Prise 2

$$= \frac{\sqrt{2}}{3}$$

Exemple $\int_{\frac{\pi}{12}}^{\frac{3\pi}{12}} \sin(3x)\ dx \qquad u = 3x \quad du = 3dx \quad dx = \frac{du}{3}$

$$\int_{?}^{?} \frac{\sin u}{3}\ du = -\frac{\cos u}{3}\Big|_{?}^{?} = -\frac{\cos 3x}{3}\Big|_{\frac{\pi}{12}}^{\frac{3\pi}{12}}$$

Prise 2

$$= \frac{\sqrt{2}}{3}$$

Exemple

$$\int_{\frac{\pi}{12}}^{\frac{3\pi}{12}} \sin(3x)\ dx \qquad u = 3x \quad du = 3dx \quad dx = \frac{du}{3}$$

$$\int_{?}^{?} \frac{\sin u}{3}\ du = -\frac{\cos u}{3}\bigg|_{?}^{?} = -\frac{\cos 3x}{3}\bigg|_{\frac{\pi}{12}}^{\frac{3\pi}{12}}$$

Prise 2

$$= -\frac{\cos 3\,\frac{3\pi}{12}}{3} + \frac{\cos 3\,\frac{\pi}{12}}{3}$$

$$= \frac{\sqrt{2}}{3}$$

Exemple

$$\int_{\frac{\pi}{12}}^{\frac{3\pi}{12}} \sin(3x)\ dx \qquad u = 3x \quad du = 3dx \quad dx = \frac{du}{3}$$

$$\int_{?}^{?} \frac{\sin u}{3}\ du = -\frac{\cos u}{3}\Big|_{?}^{?} = -\frac{\cos 3x}{3}\Bigg|_{\frac{\pi}{12}}^{\frac{3\pi}{12}}$$

Prise 2

$$= -\frac{\cos 3\,\frac{3\pi}{12}}{3} + \frac{\cos 3\,\frac{\pi}{12}}{3} = -\frac{\cos\ \frac{3\pi}{4}}{3} + \frac{\cos\ \frac{\pi}{4}}{3}$$

$$= \frac{\sqrt{2}}{3}$$

Exemple

$$\int_{\frac{\pi}{12}}^{\frac{3\pi}{12}} \sin(3x)\ dx \qquad u = 3x \quad du = 3dx \quad dx = \frac{du}{3}$$

$$\int_{?}^{?} \frac{\sin u}{3}\ du = -\frac{\cos u}{3}\Big|_{?}^{?} = -\frac{\cos 3x}{3}\Big|_{\frac{\pi}{12}}^{\frac{3\pi}{12}}$$

Prise 2

$$= -\frac{\cos 3\,\frac{3\pi}{12}}{3} + \frac{\cos 3\,\frac{\pi}{12}}{3} = -\frac{\cos\frac{3\pi}{4}}{3} + \frac{\cos\frac{\pi}{4}}{3}$$

$$= -\frac{-\frac{\sqrt{2}}{2}}{3} + \frac{\frac{\sqrt{2}}{2}}{3} \qquad = \frac{\sqrt{2}}{3}$$

Exemple $\displaystyle\int_{\frac{\pi}{12}}^{\frac{3\pi}{12}} \sin(3x)\ dx \qquad u = 3x \quad du = 3dx \quad dx = \frac{du}{3}$

$$\int_{?}^{?} \frac{\sin u}{3}\ du = -\frac{\cos u}{3}\Big|_{?}^{?} = -\frac{\cos 3x}{3}\Big|_{\frac{\pi}{12}}^{\frac{3\pi}{12}}$$

Prise 2

$$= -\frac{\cos 3\,\frac{3\pi}{12}}{3} + \frac{\cos 3\,\frac{\pi}{12}}{3} = -\frac{\cos\,\frac{3\pi}{4}}{3} + \frac{\cos\,\frac{\pi}{4}}{3}$$

$$= -\frac{-\frac{\sqrt{2}}{2}}{3} + \frac{\frac{\sqrt{2}}{2}}{3} = 2\frac{\frac{\sqrt{2}}{2}}{3} = \frac{\sqrt{2}}{3}$$

Faites les exercices suivants

Section 1.6 # 34 à 36

Quelle est la différence entre

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

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$$\int_a^b f(x)\ dx \qquad \int_a^b f(t)\ dt$$

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À part la lettre utilisée pour la variable, il n'y en a pas

$$\int_a^b f(x)\ dx = F(b) - F(a)$$

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$$a \leq b$$

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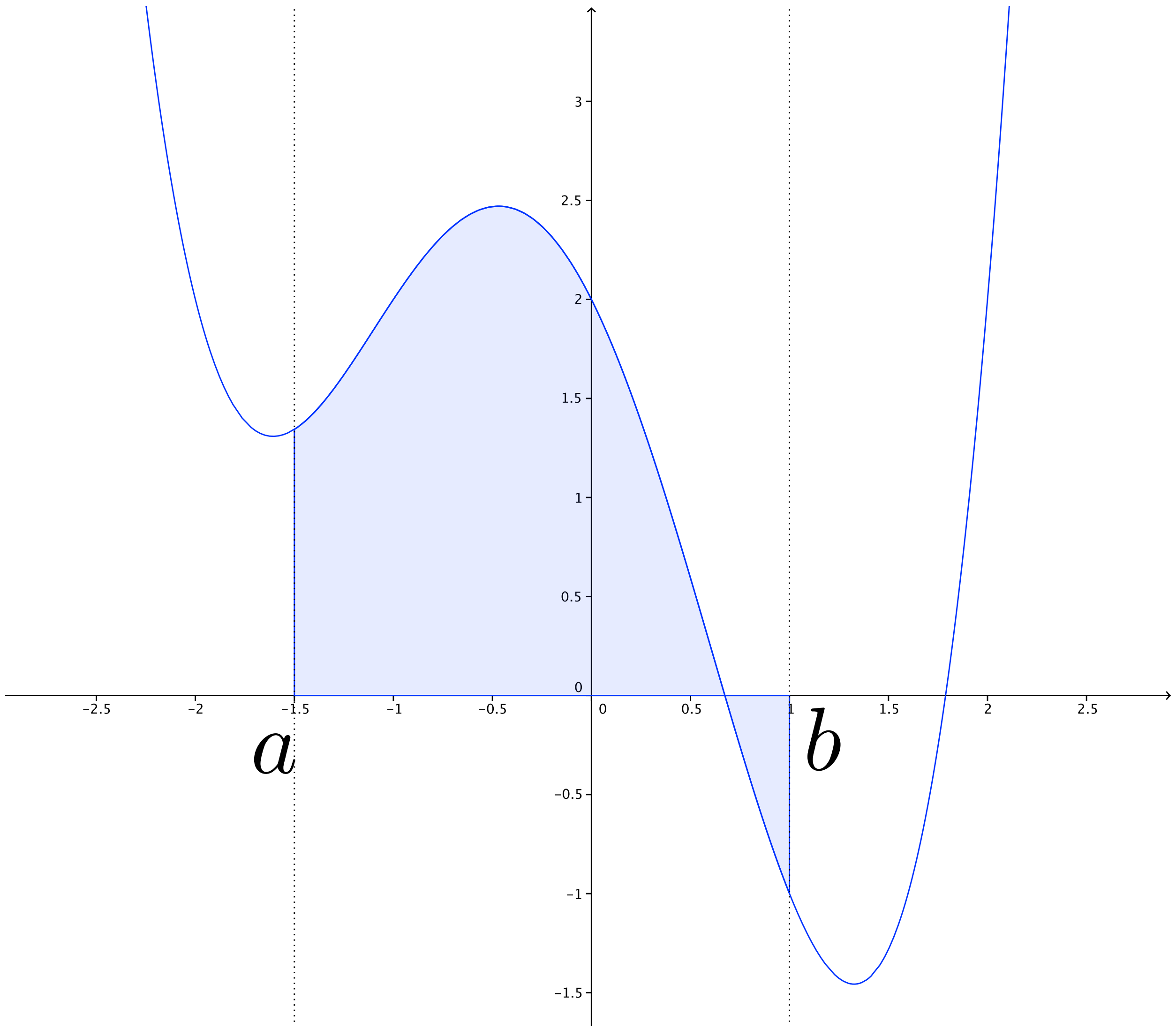

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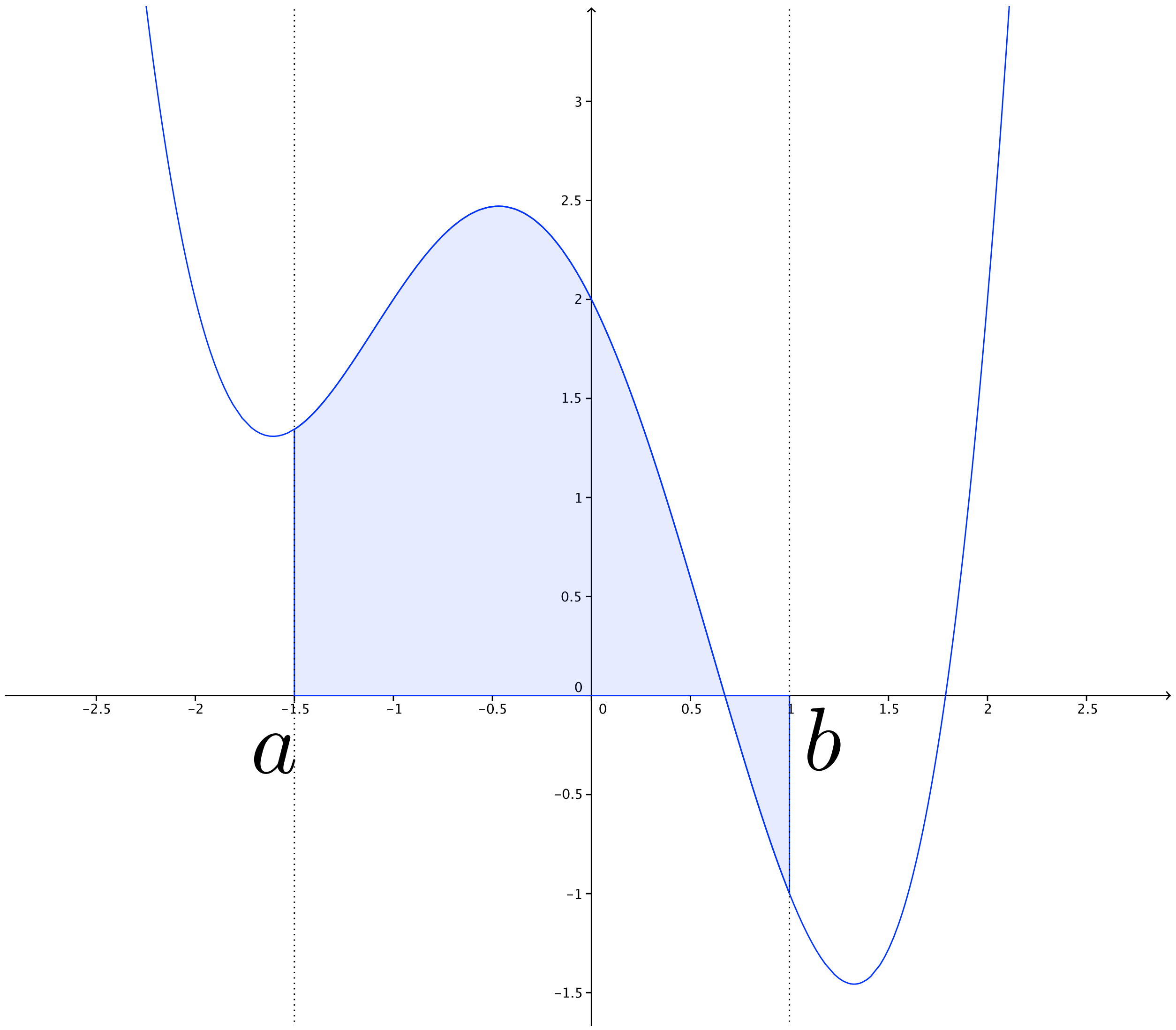

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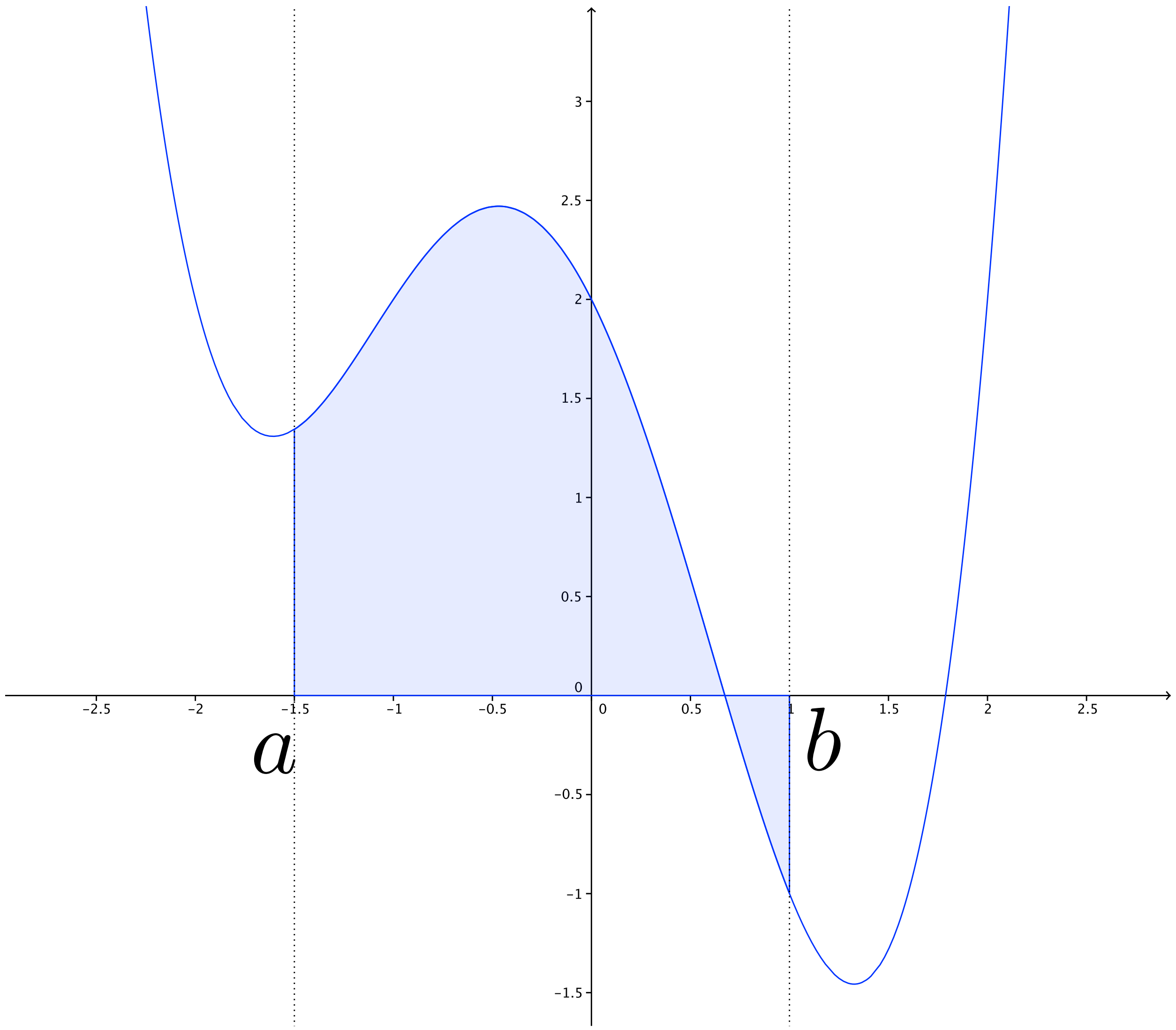

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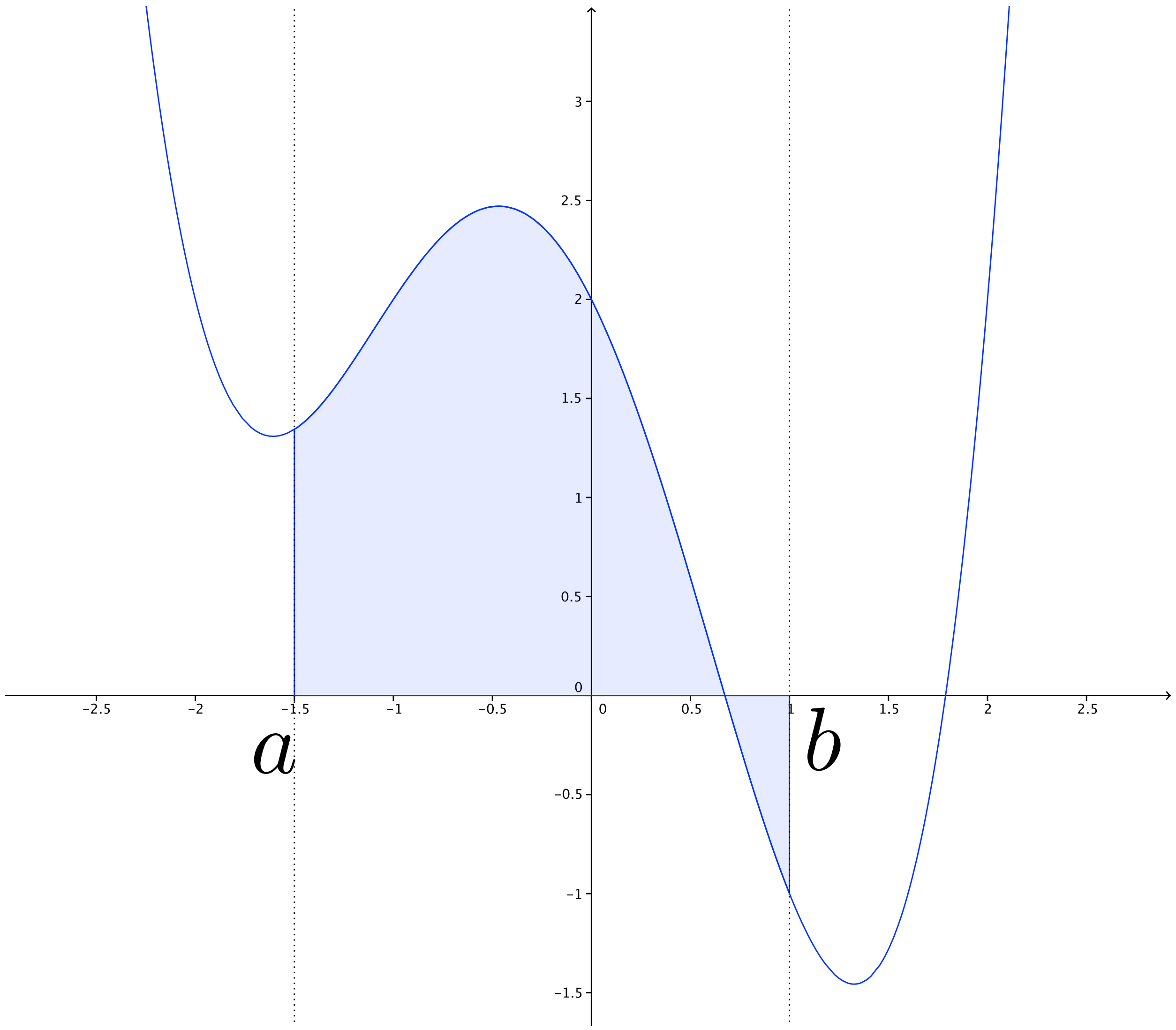

$$\int_b^a f(x)\ dx = F(a) - F(b)$$

$$= -(F(b) - F(a))$$

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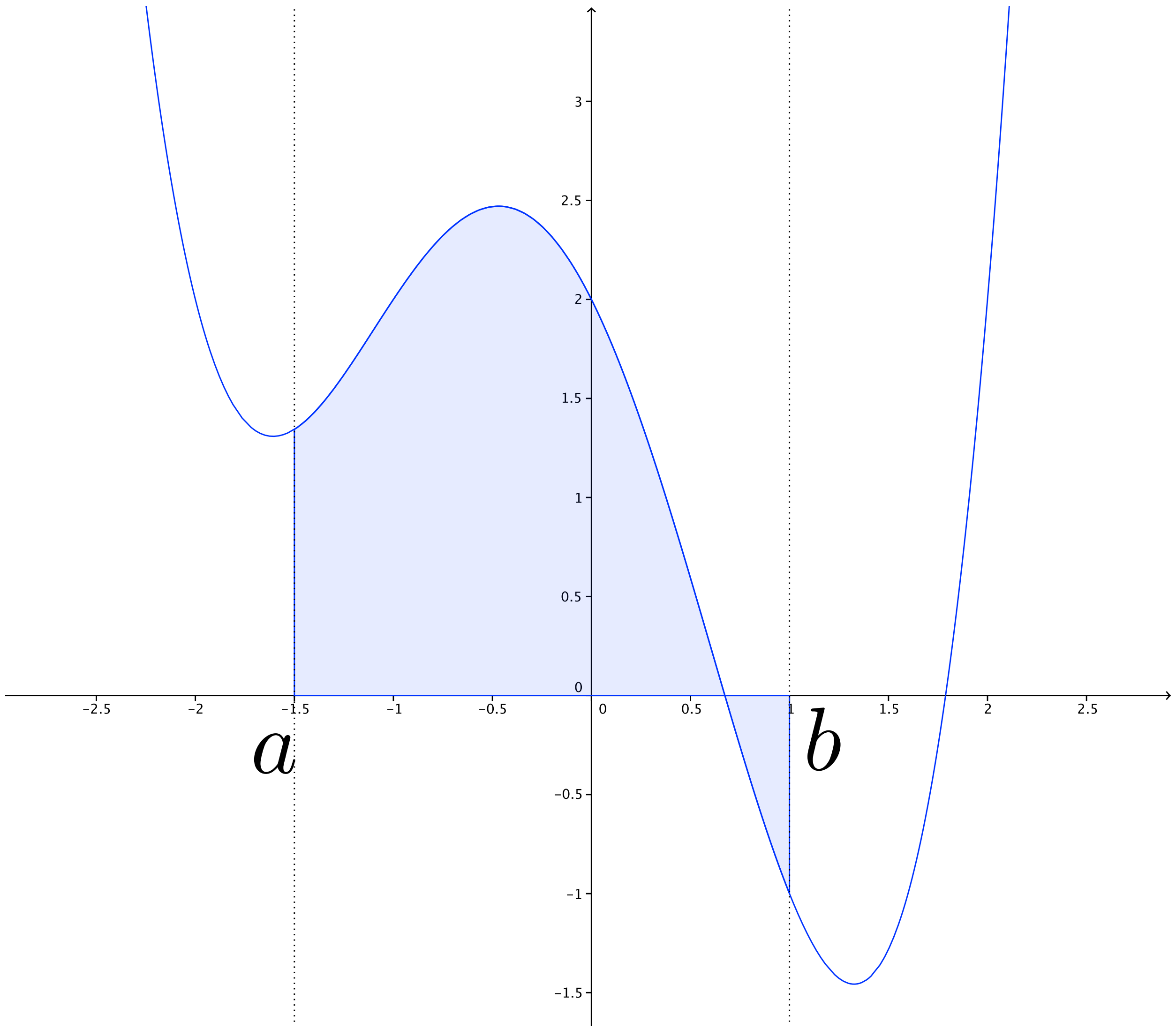

$$\begin{aligned}\int_b^a f(x)\ dx &= F(a) - F(b) \\ &= -(F(b) - F(a)) \\ &= -\int_a^b f(x)\ dx\end{aligned}$$

Un dit qu'une fonction est pair si $f(x) = f(-x)$

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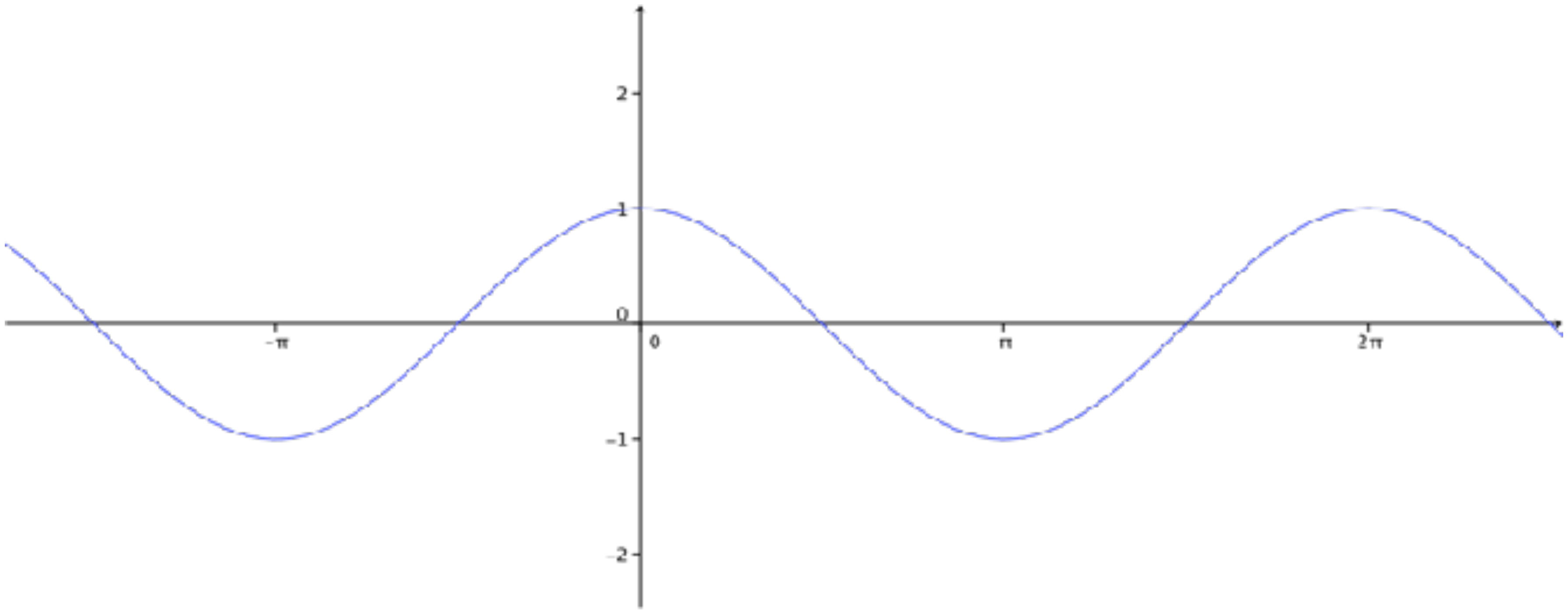

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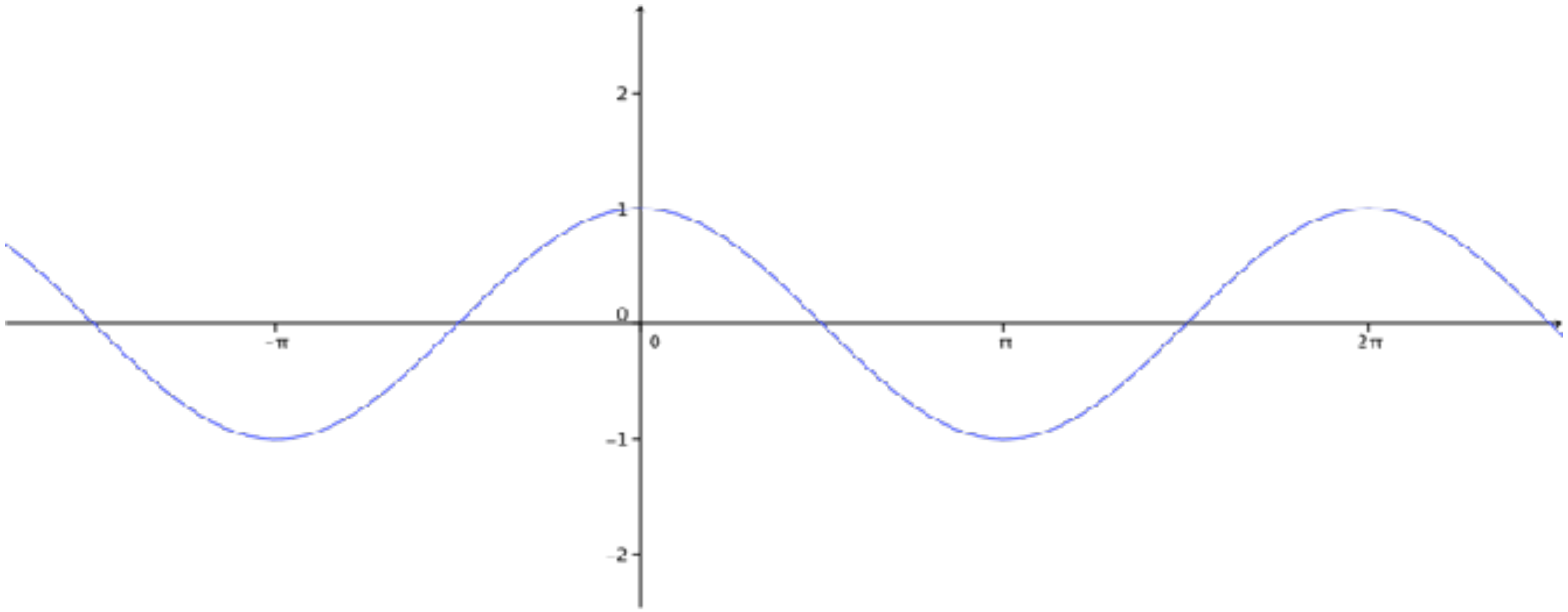

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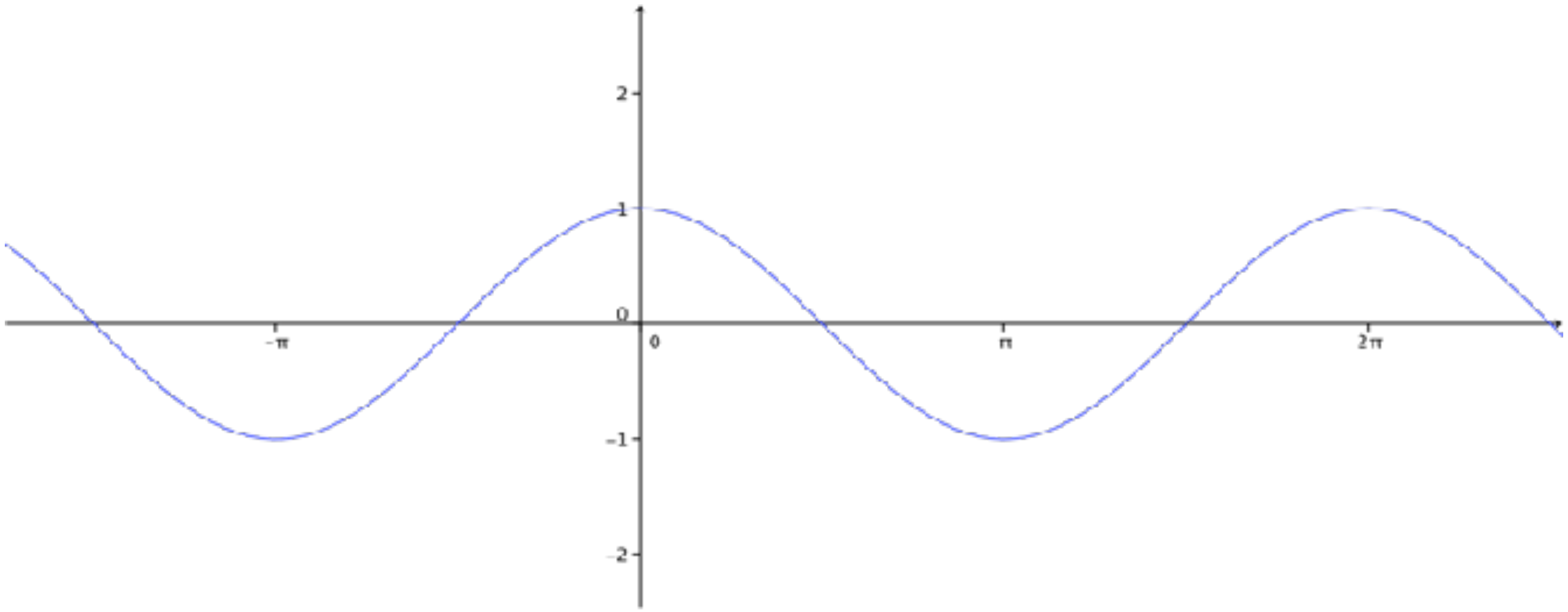

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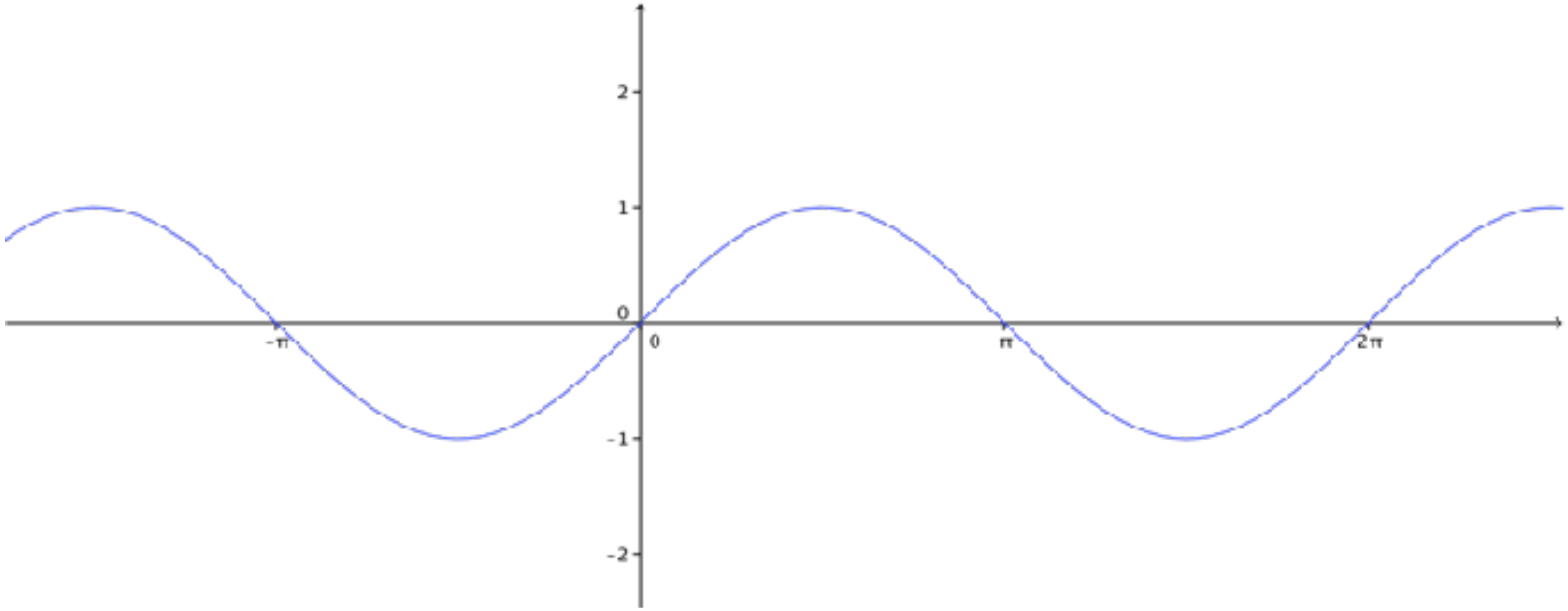

$$\int_{-a}^{a} f(x)\ dx$$

$$\int_{-a}^{a} f(x)\ dx \ = \int_{-a}^{0} f(x)\ dx + \int_{0}^{a} f(x)\ dx$$

$$\begin{aligned}\int_{-a}^{a} f(x)\ dx\ &= \int_{-a}^{0} f(x)\ dx + \int_{0}^{a} f(x)\ dx \\ &= -\int_{0}^{-a} f(x)\ dx + \int_{0}^{a} f(x)\ dx\end{aligned}$$

$$\begin{aligned}\int_{-a}^{a} f(x)\ dx &= \int_{-a}^{0} f(x)\ dx + \int_{0}^{a} f(x)\ dx \\ &= -\int_{0}^{-a} f(x)\ dx + \int_{0}^{a} f(x)\ dx \\ &= -\int_{0}^{-a} f(-(-x))\ dx + \int_{0}^{a} f(x)\ dx\end{aligned}$$

$$\int_{-a}^{a} f(x)\ dx\ = \int_{-a}^{0} f(x)\ dx + \int_{0}^{a} f(x)\ dx$$

$$u = -x$$

$$= -\int_{0}^{-a} f(x)\ dx + \int_{0}^{a} f(x)\ dx$$

$$= -\int_{0}^{-a} f(-(-x))\ dx + \int_{0}^{a} f(x)\ dx$$

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---

si $f(x)$
est pair

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si $f(x)$
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$$= \int_{0}^{a} f(u)\ du + \int_{0}^{a} f(x)\ dx \ = 2\int_{0}^{a} f(x)\ dx$$

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si $f(x)$
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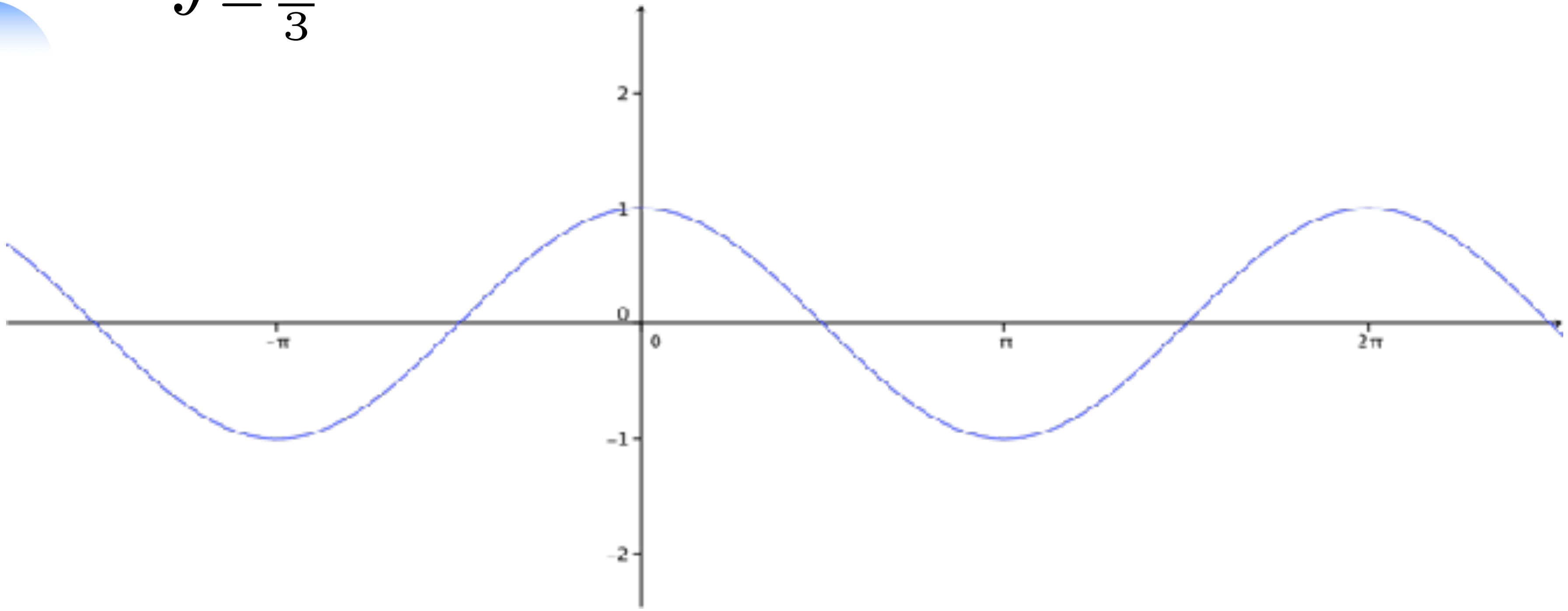
$$= -\int_{0}^{a} f(u)\ du + \int_{0}^{a} f(x)\ dx = 0$$

Exemple

$$\int_{-\frac{\pi}{3}}^{\frac{\pi}{3}} \cos x \; dx$$

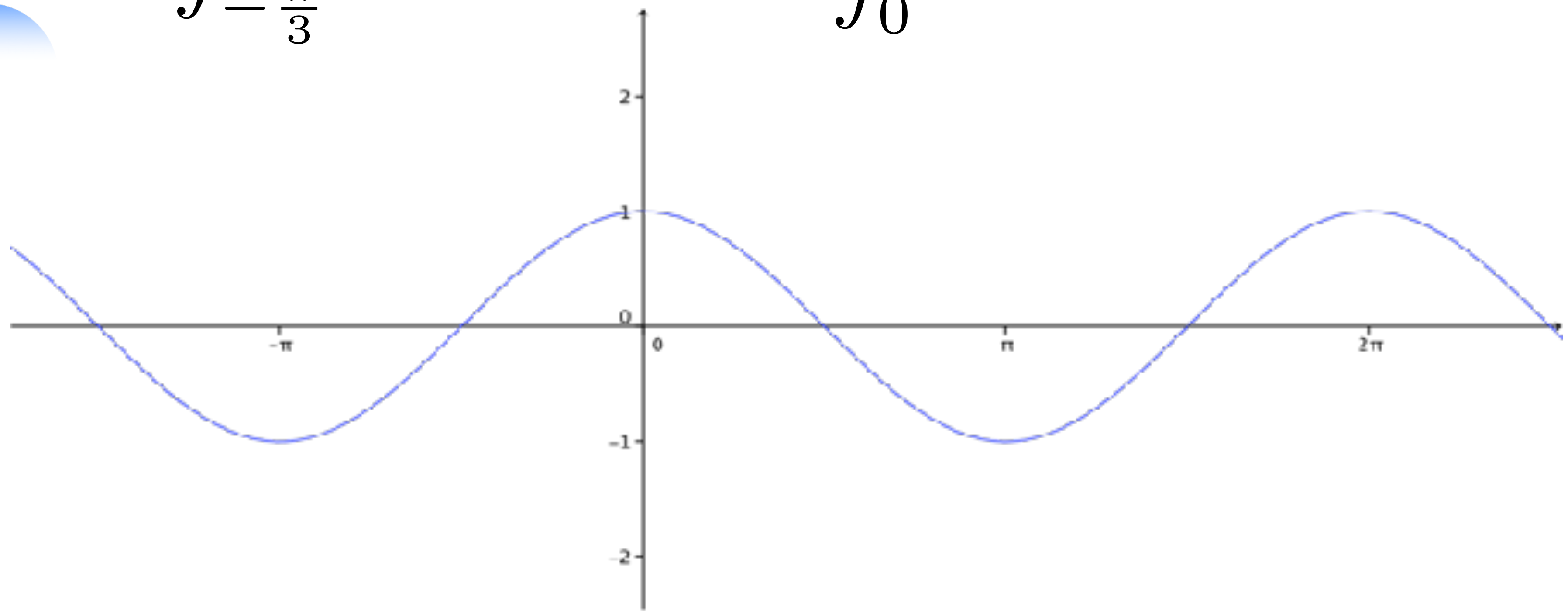
Exemple

$$\int_{-\frac{\pi}{3}}^{\frac{\pi}{3}} \cos x \;\; dx$$



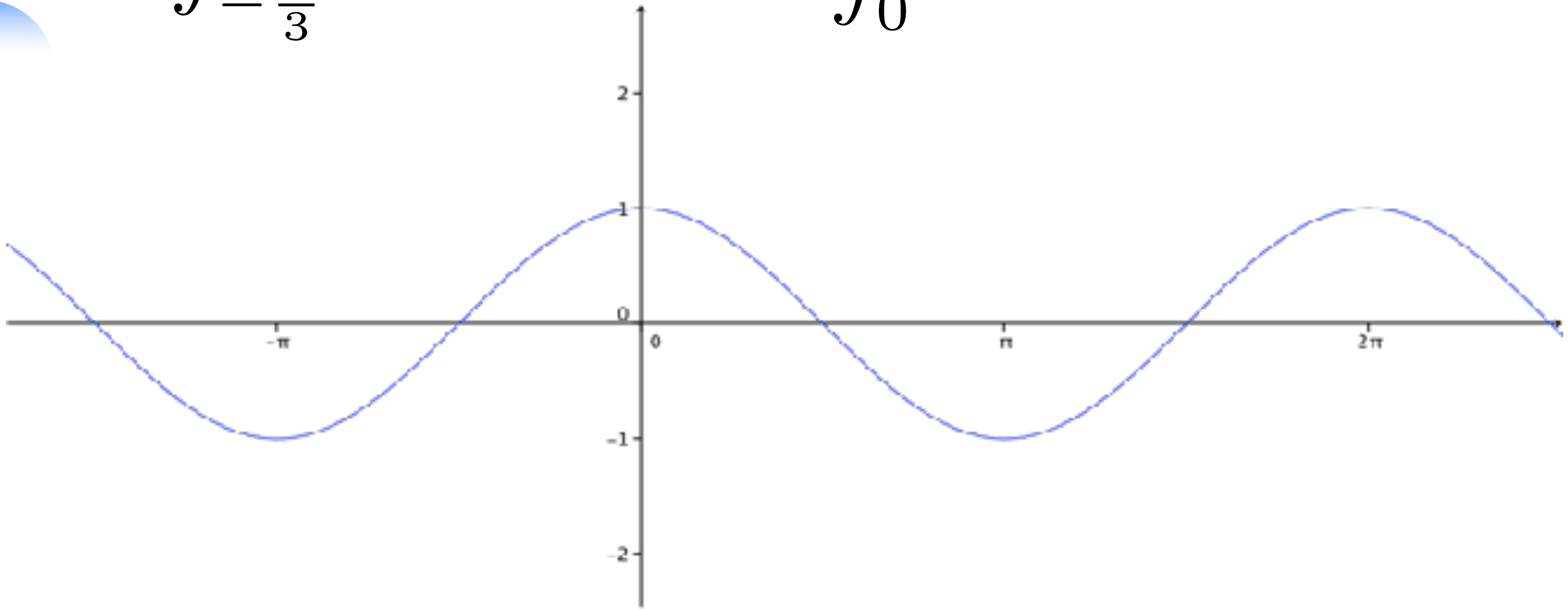
Exemple

$$\int_{-\frac{\pi}{3}}^{\frac{\pi}{3}} \cos x \ dx = 2\int_{0}^{\frac{\pi}{3}} \cos x \ dx$$



Exemple

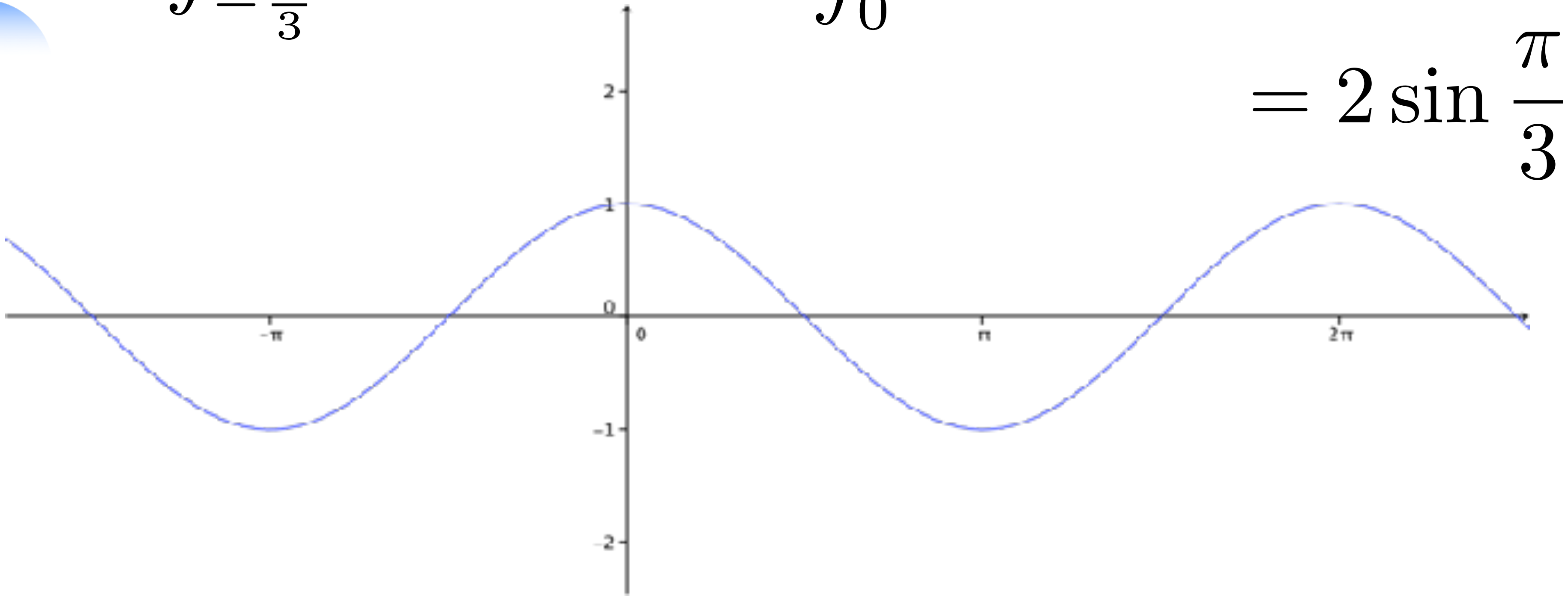
$$\int_{-\frac{\pi}{3}}^{\frac{\pi}{3}} \cos x \ dx = 2\int_{0}^{\frac{\pi}{3}} \cos x \ dx = 2\sin x\Big|_{0}^{\frac{\pi}{3}}$$



Exemple

$$\int_{-\frac{\pi}{3}}^{\frac{\pi}{3}} \cos x \;dx \;= 2\int_{0}^{\frac{\pi}{3}} \cos x \;dx \;= 2\sin x\Big|_{0}^{\frac{\pi}{3}}$$

$$= 2\sin\frac{\pi}{3} - 2\sin 0$$



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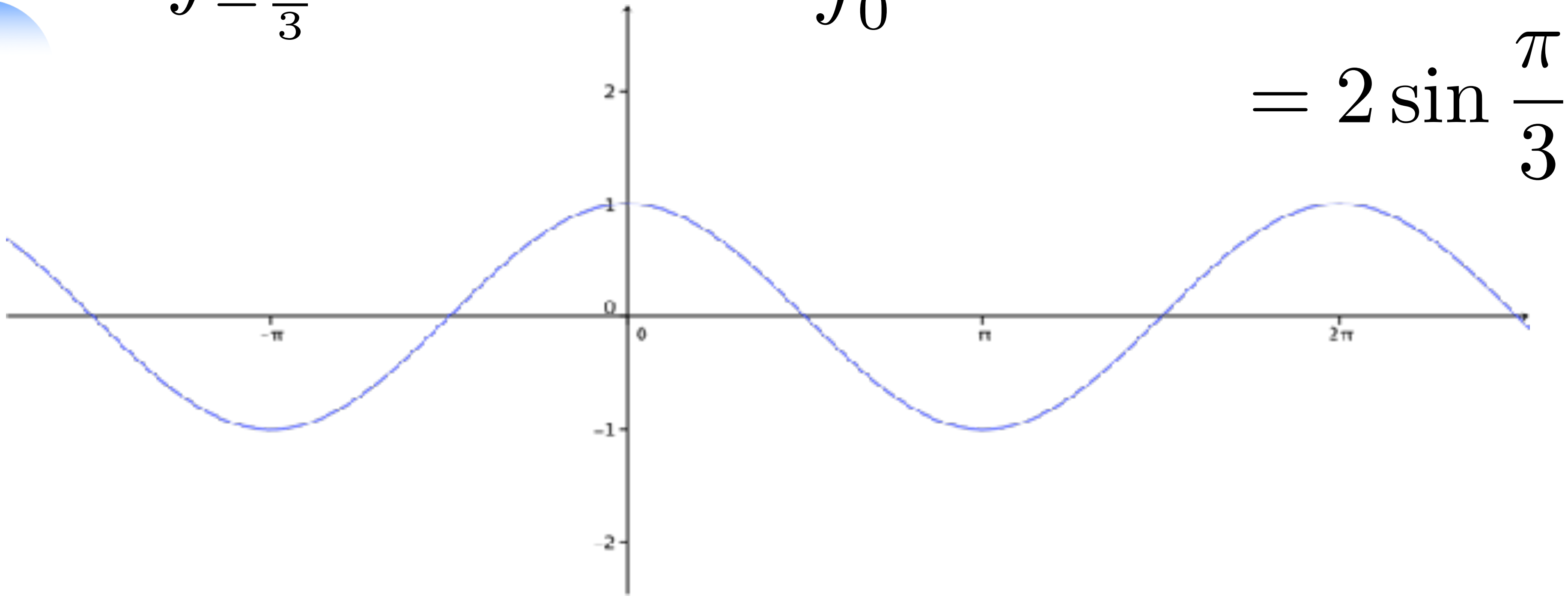
$$= 2\sin\frac{\pi}{3} - 2\sin 0$$

$$= \sqrt{3}$$



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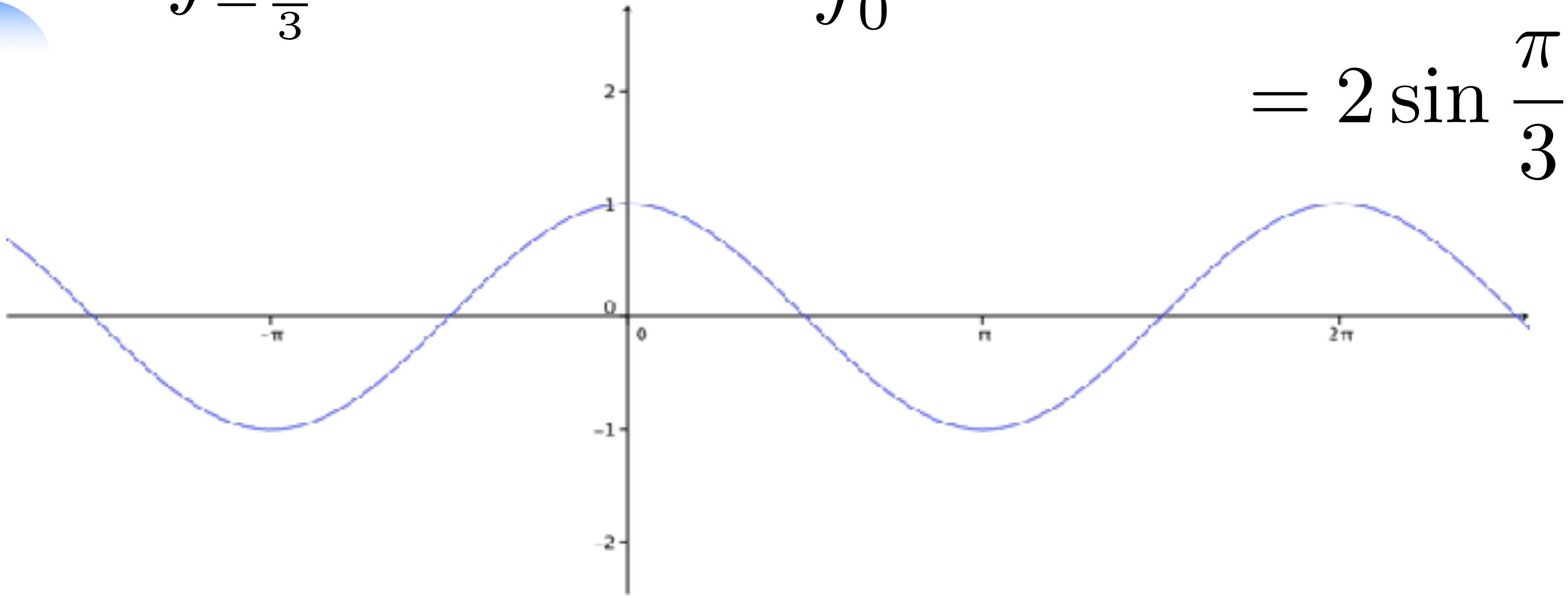

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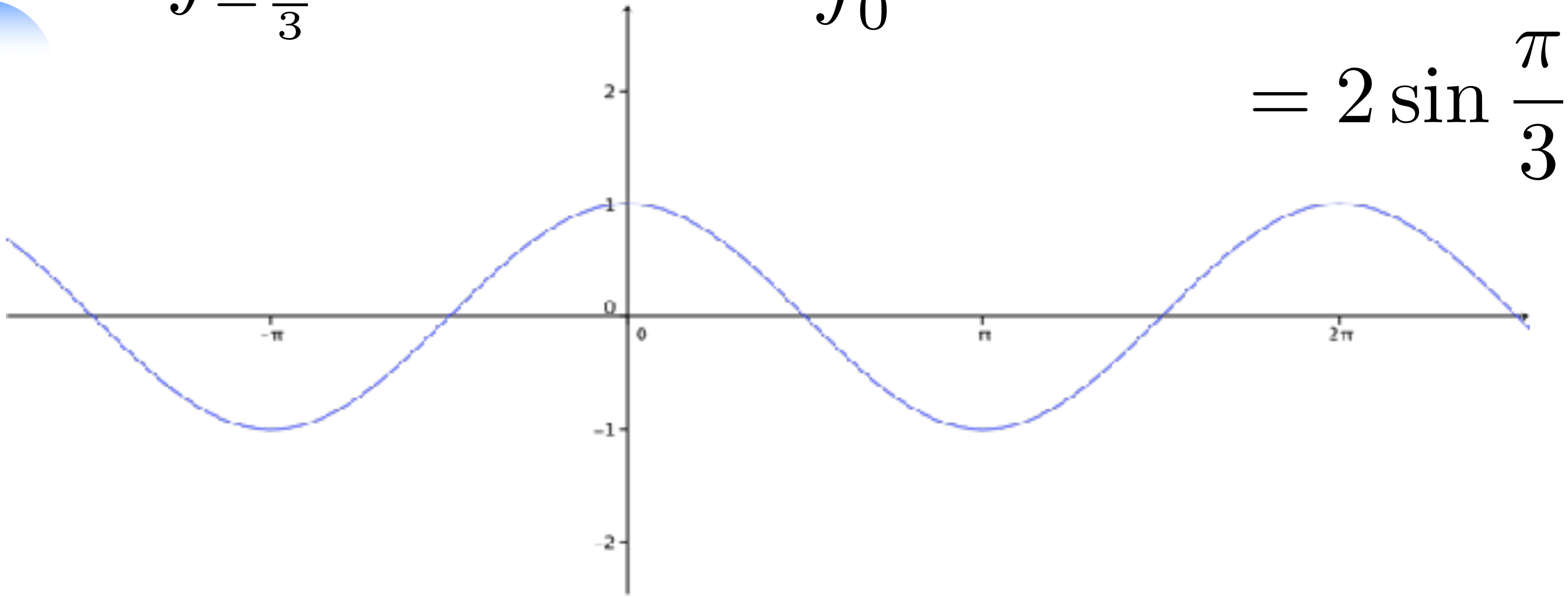

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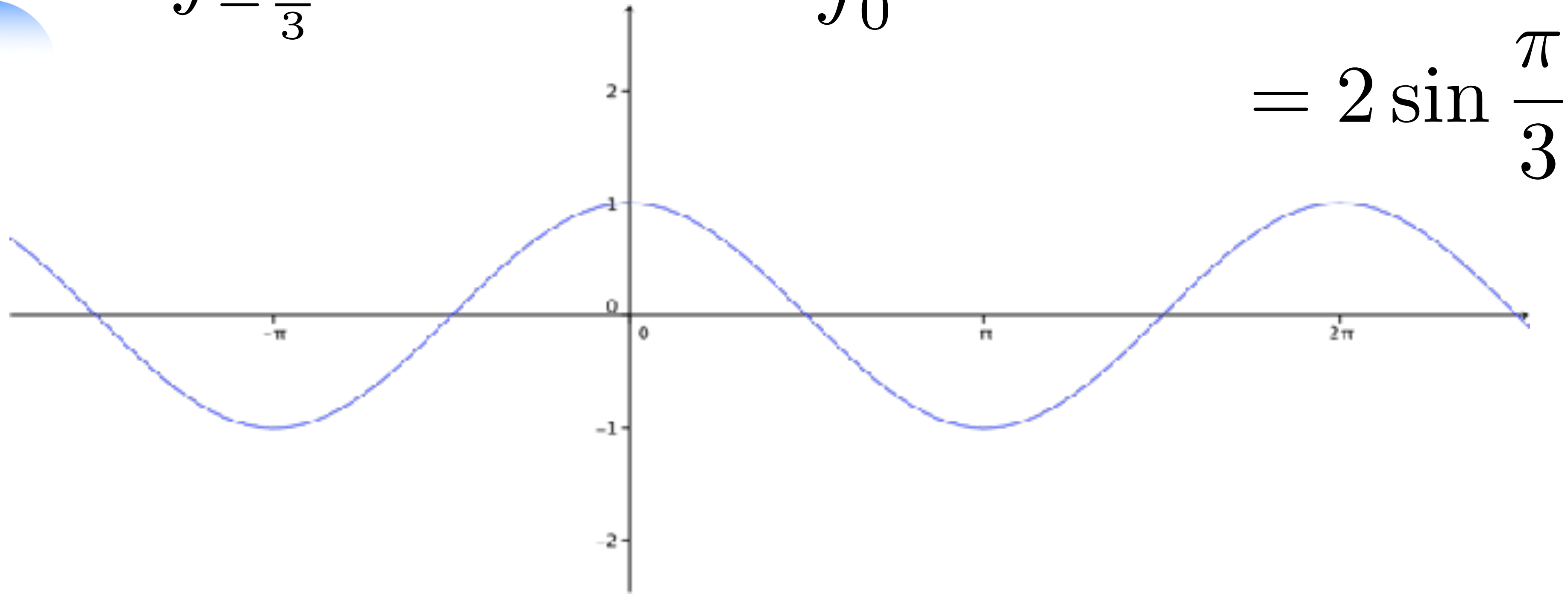

Exemple

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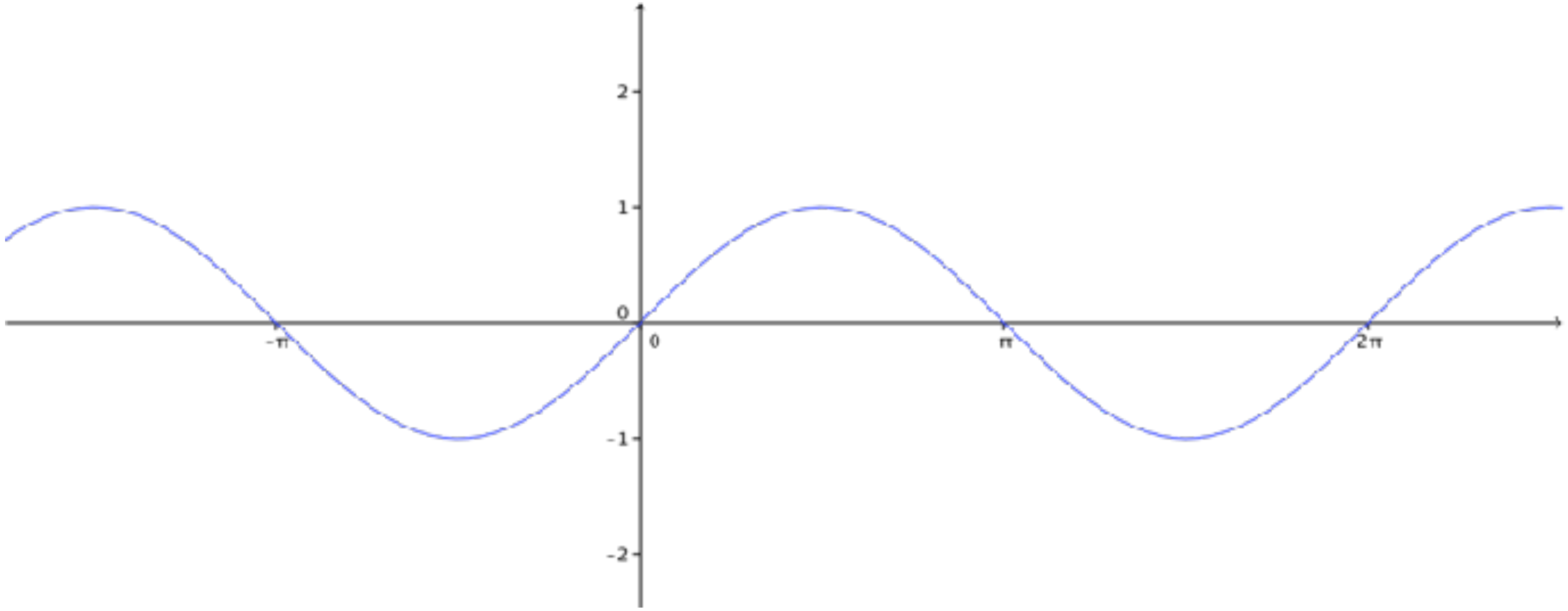

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$$\int_{-\frac{\pi}{3}}^{\frac{\pi}{3}} \cos x \ dx = 2\int_{0}^{\frac{\pi}{3}} \cos x \ dx = 2\sin x\Big|_{0}^{\frac{\pi}{3}}$$

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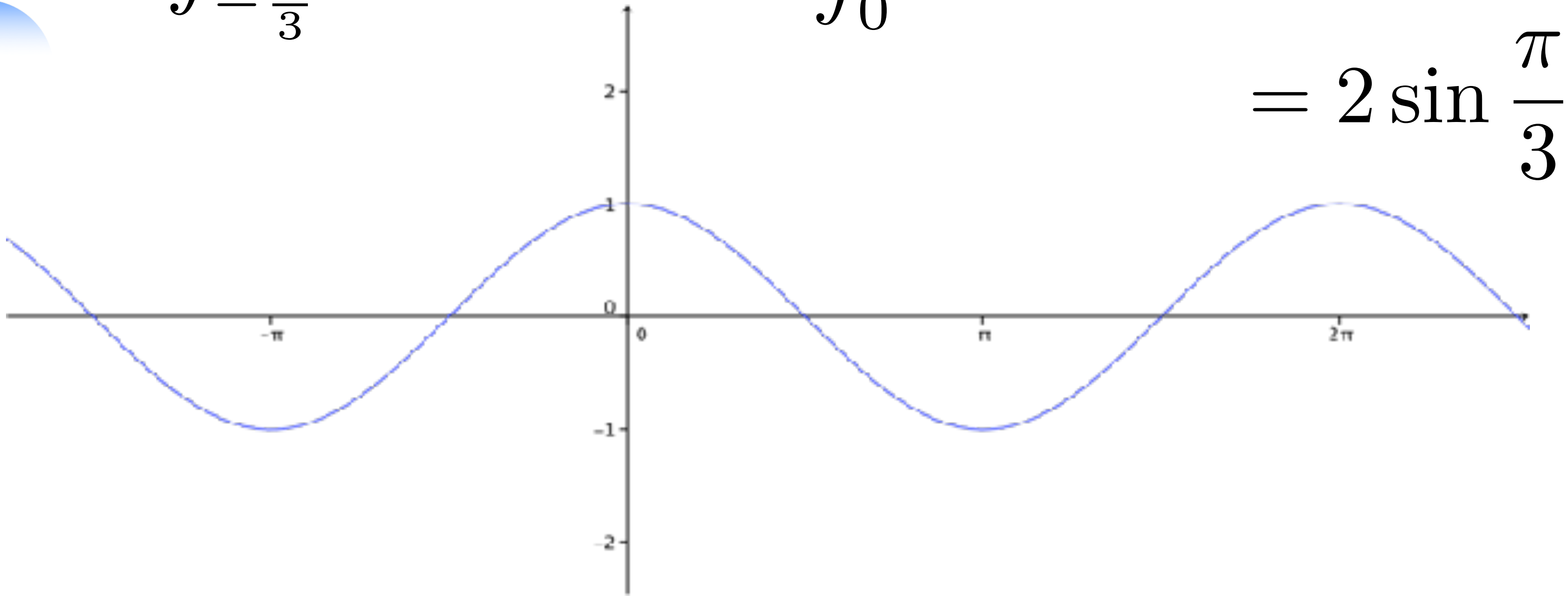
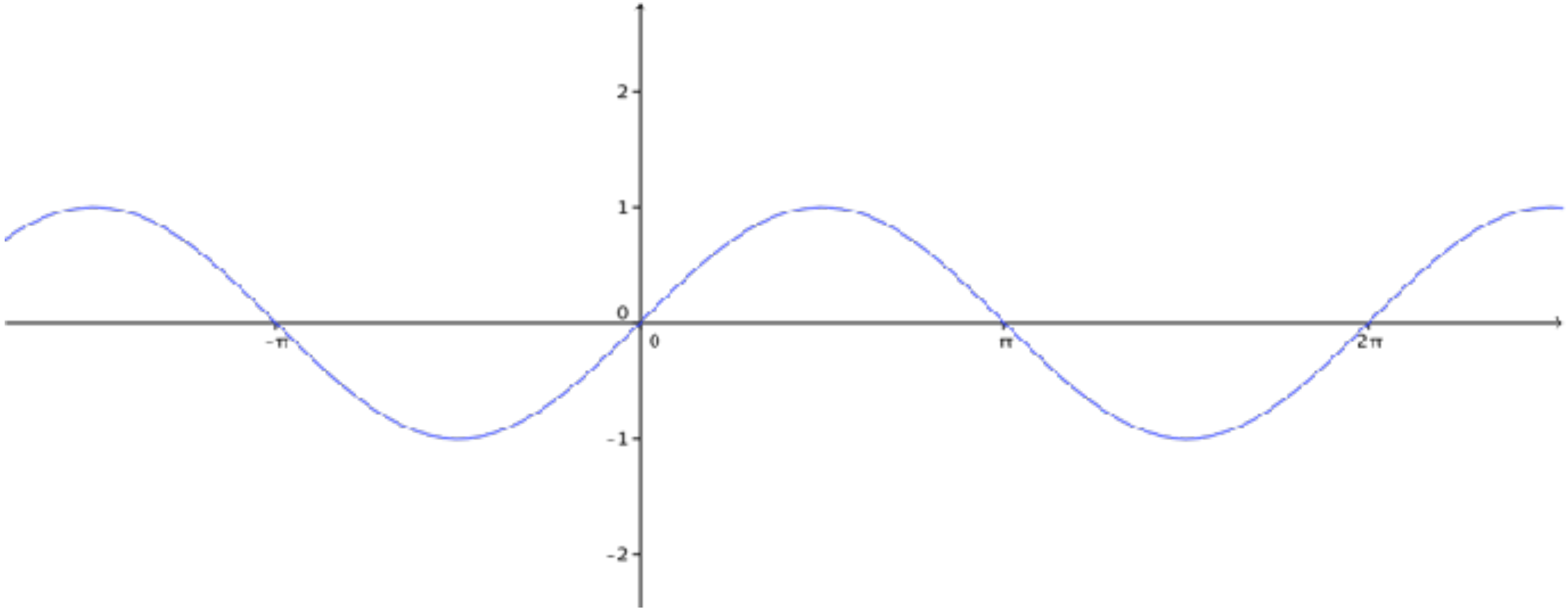


Exemple

$$\int_{-\frac{\pi}{3}}^{\frac{\pi}{3}} \sin x \ dx = 0$$



Exemple

$$\int_0^{2\pi} \sin x \; dx \quad = -\cos x \Big|_0^{2\pi}$$

Exemple

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$$= -\cos(2\pi) - (-\cos(0))$$

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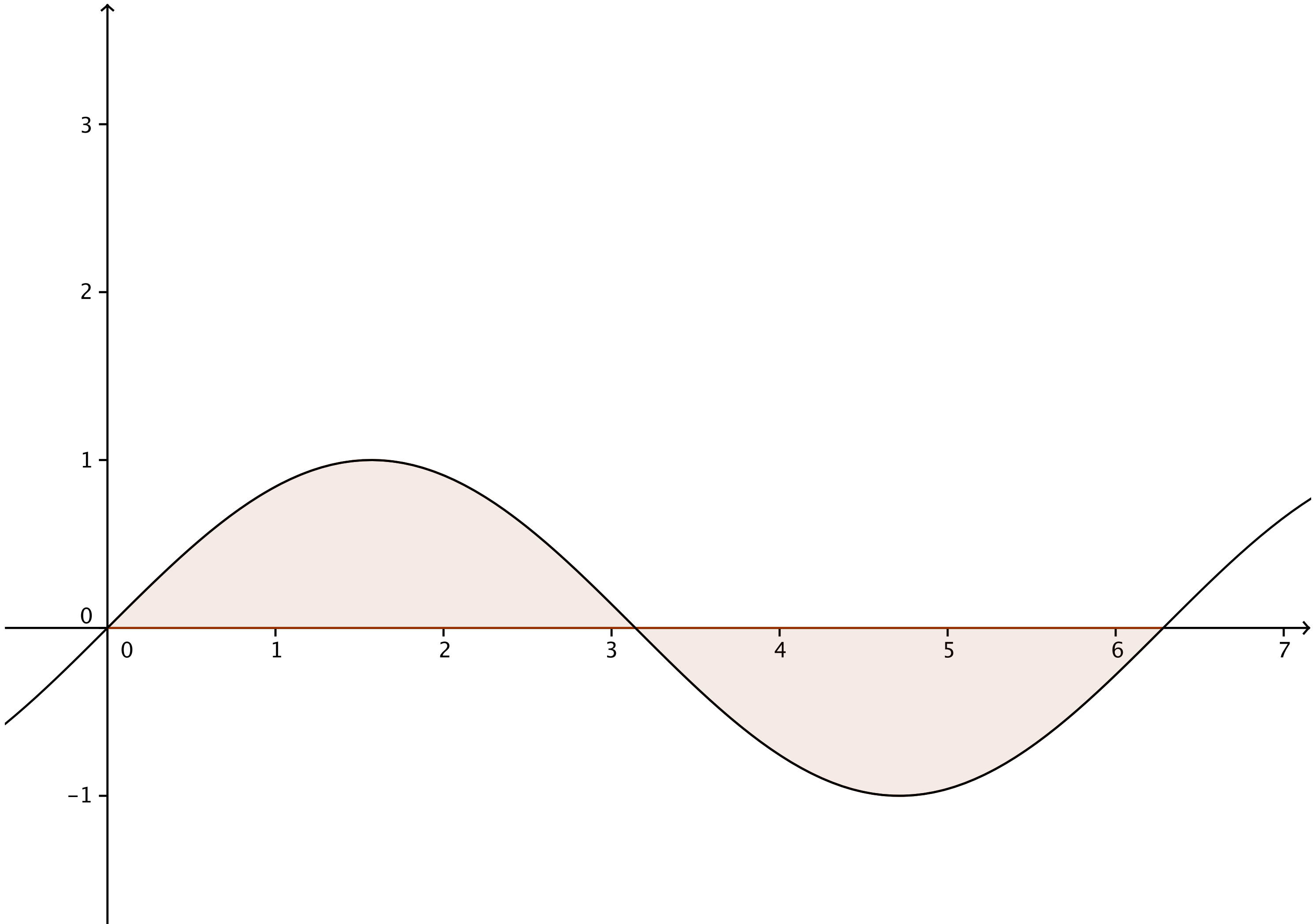

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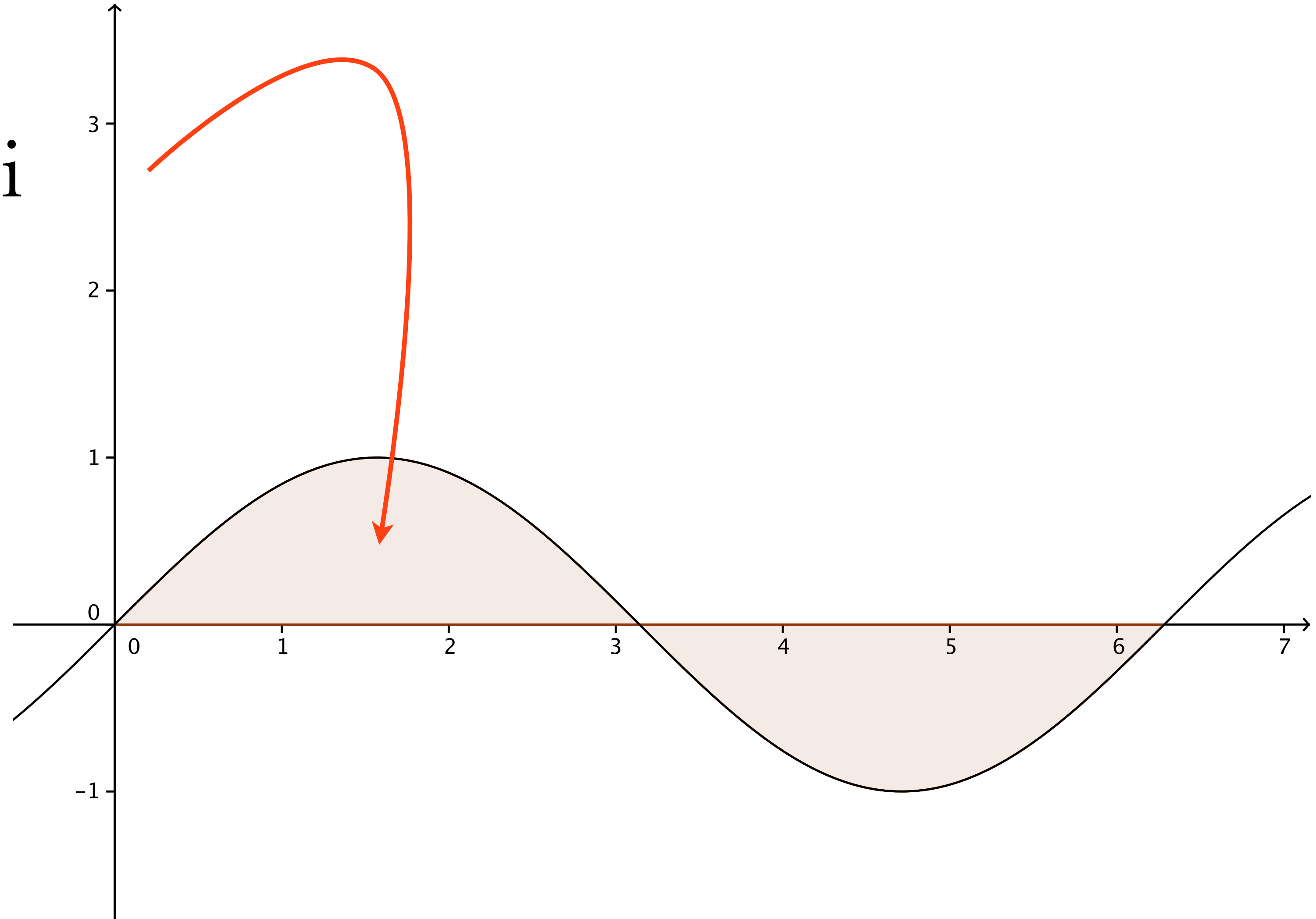
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Exemple

$$\begin{aligned}\int_0^{2\pi} \sin x \; dx &= -\cos x \Big|_0^{2\pi} \\ &= -\cos(2\pi) - (-\cos(0)) \\ &= -1 + 1 \quad = 0\end{aligned}$$

Aire ici

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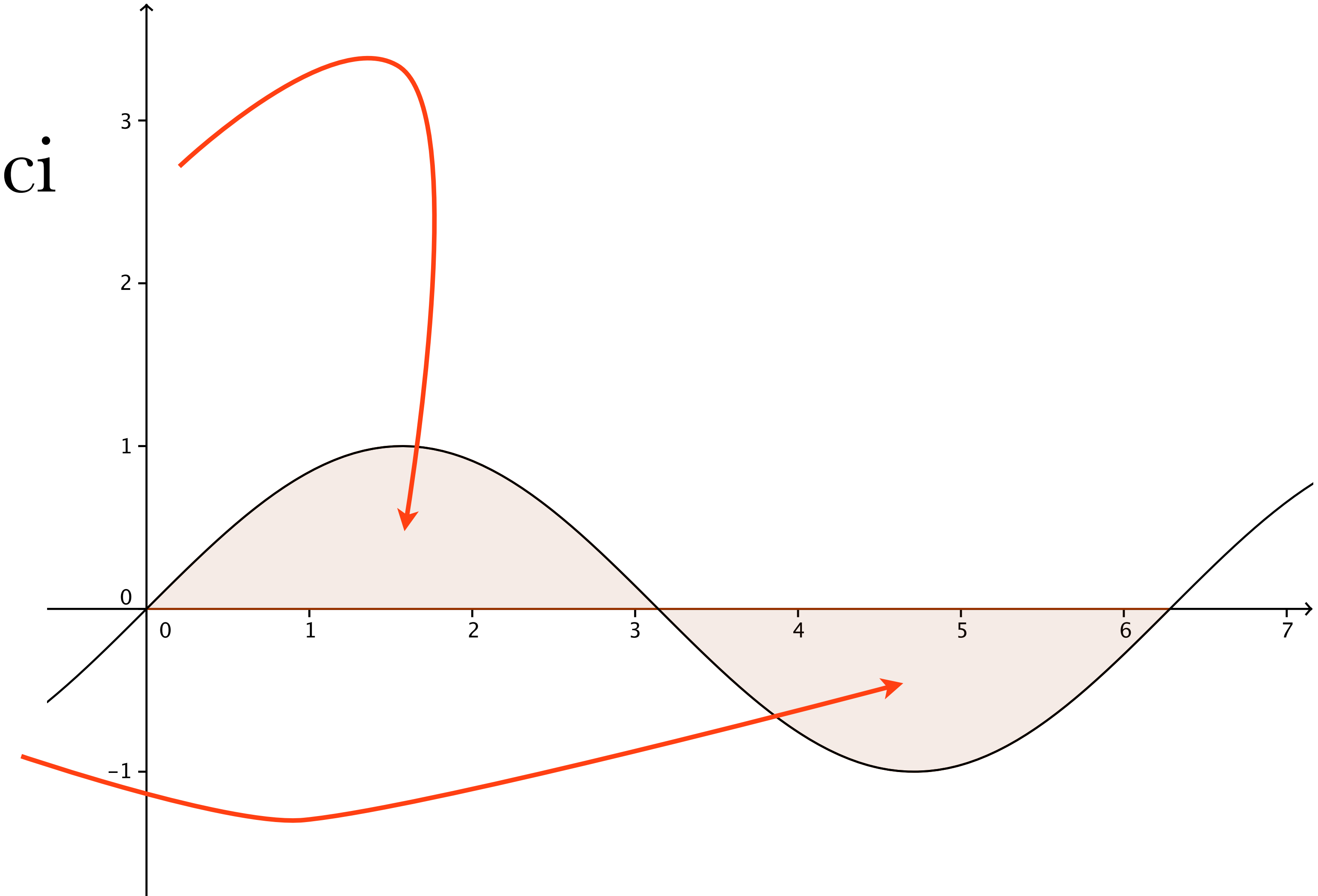
Aire ici



Exemple

$$\int_0^{2\pi} \sin x \; dx = -\cos x \Big|_0^{2\pi}$$

$$= -\cos(2\pi) - (-\cos(0))$$

$$= -1 + 1 \quad = 0$$

Comment faire pour trouver l'aire total?

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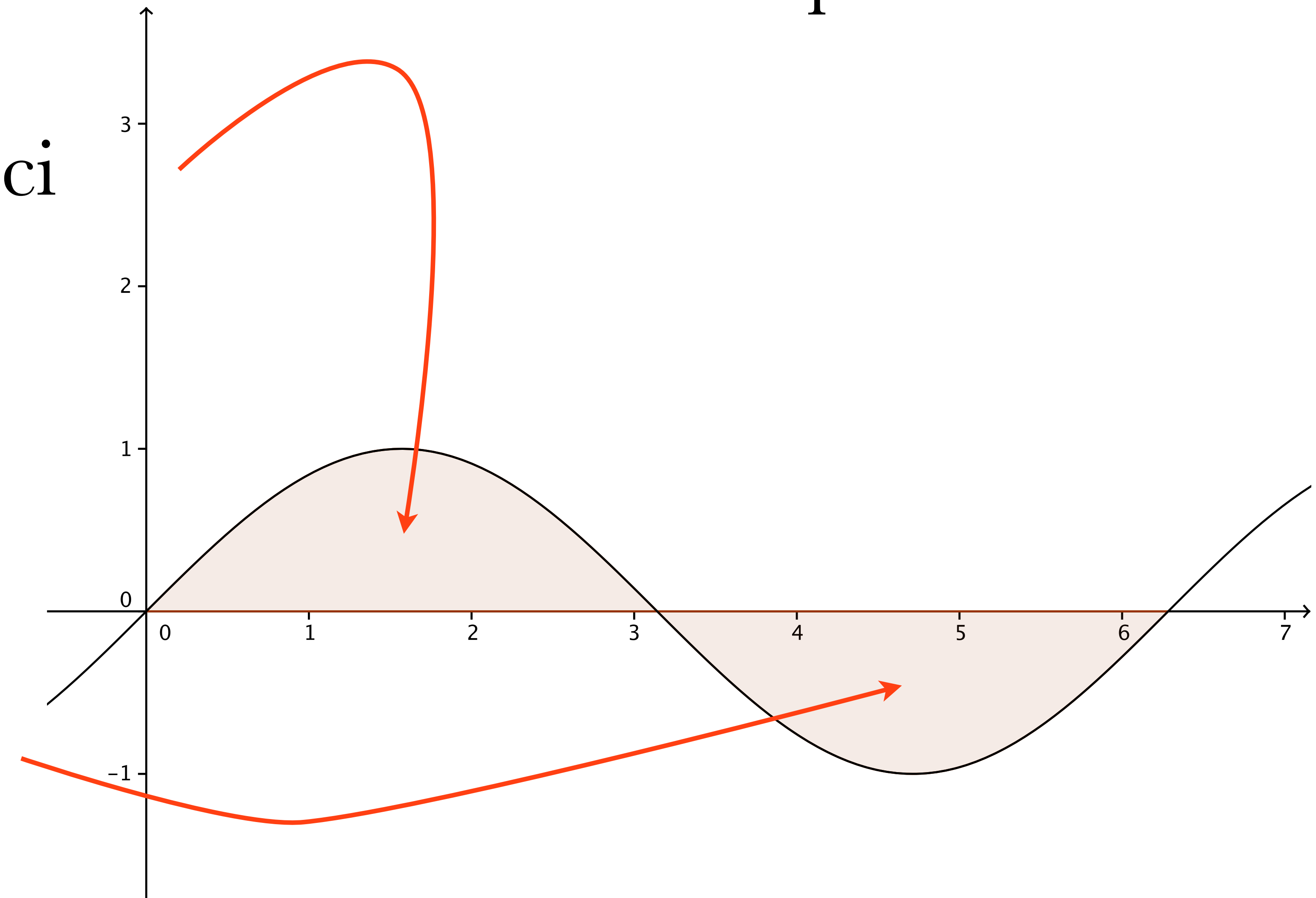
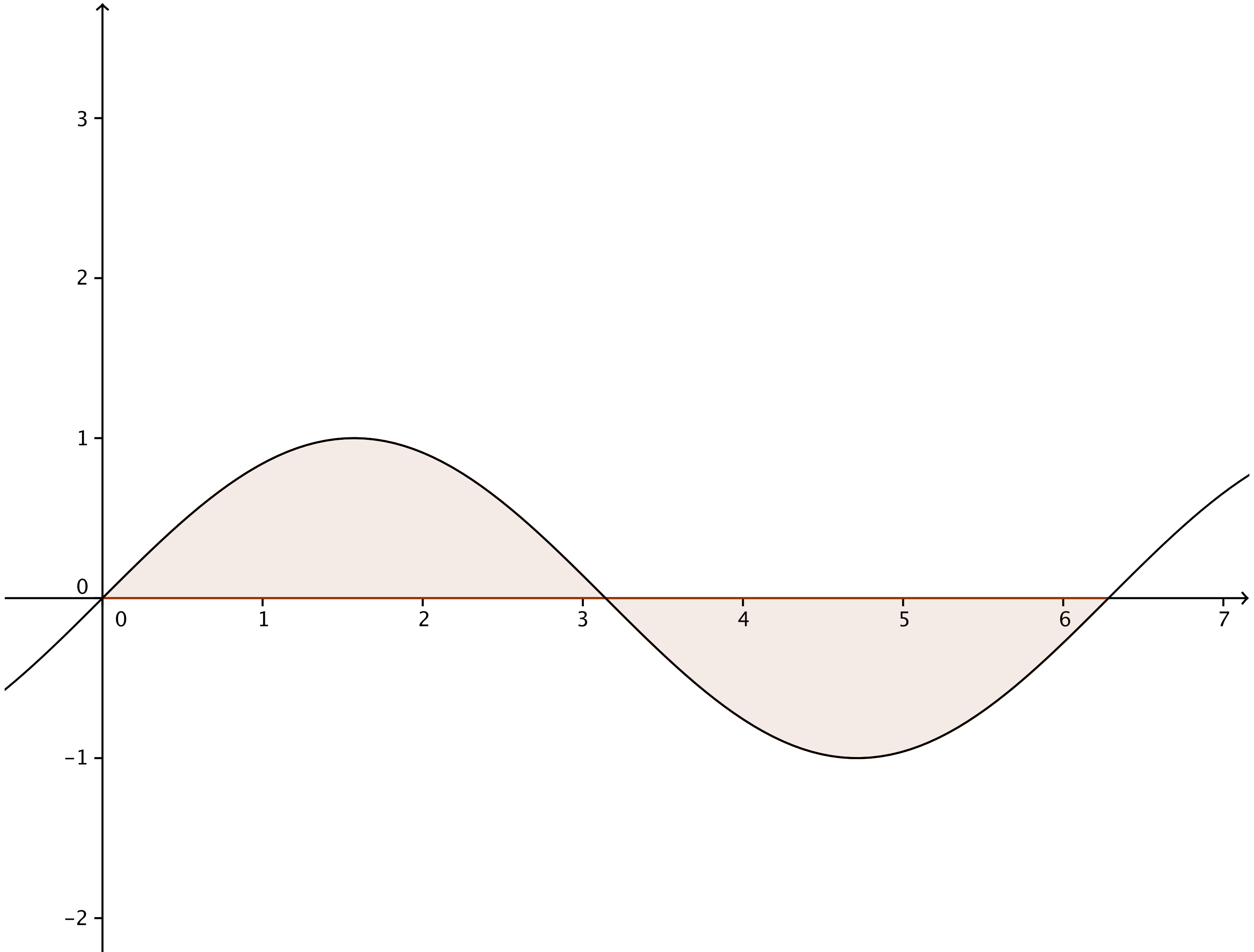


Exemple

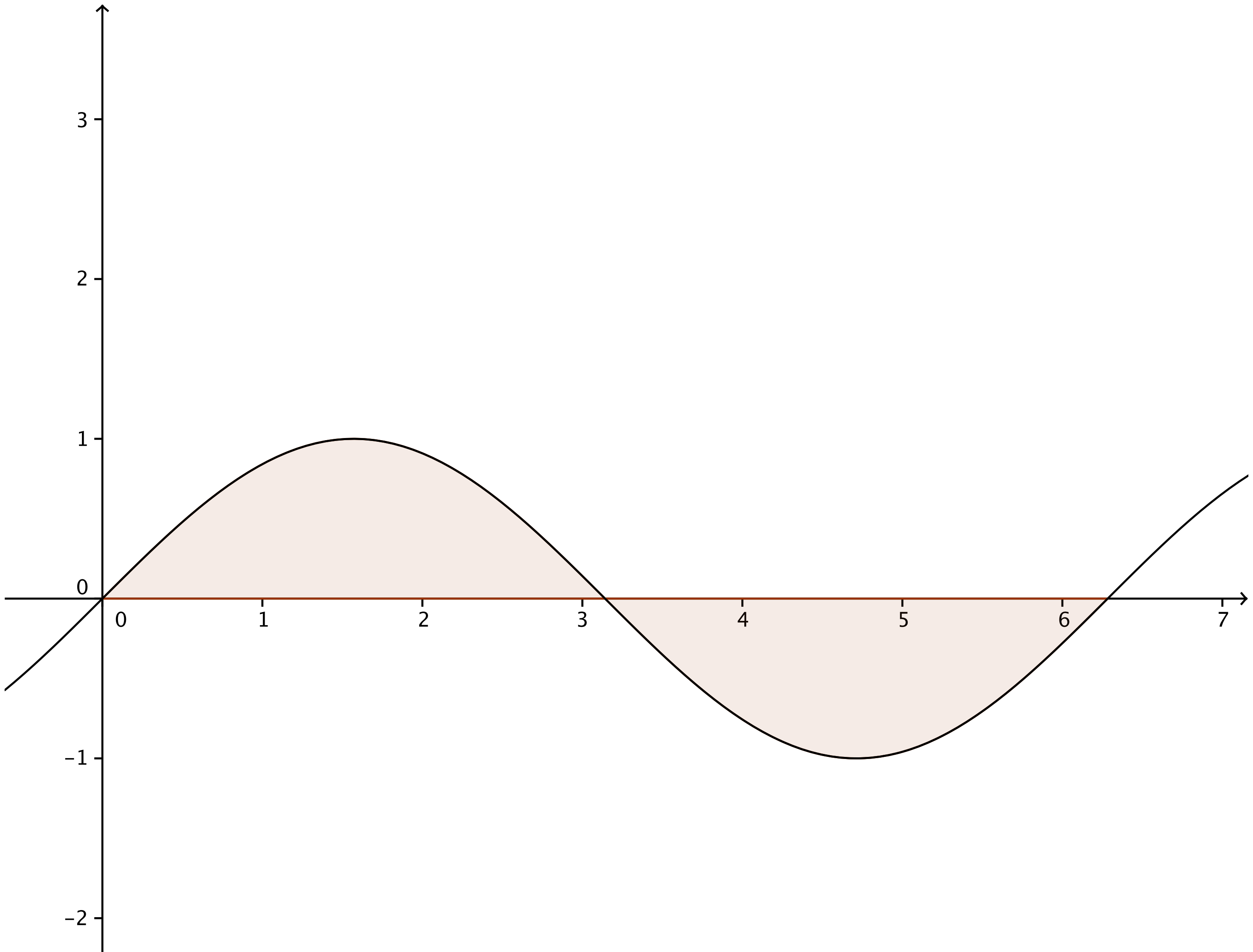
$$\int_0^{2\pi} \xcancel{\sin x}\ dx$$



Exemple

$$\int_0^{2\pi} \xcancel{\sin x}\ dx$$

On trouve les zéros de la fonction

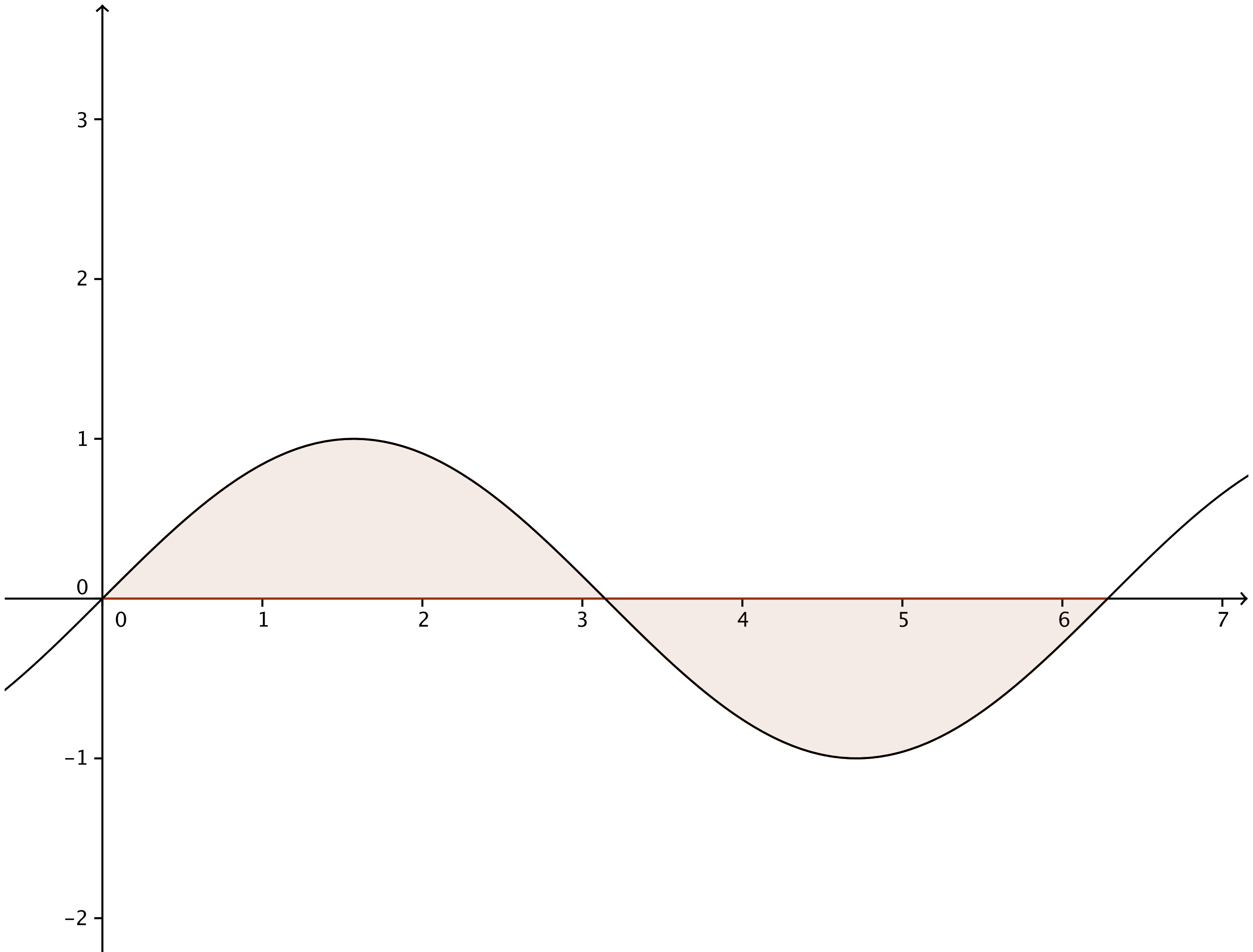


Exemple

$$\int_0^{2\pi} \xcancel{\sin x} \; dx$$

$$\sin x = 0$$

On trouve les zéros de la fonction



Exemple

$$\int_0^{2\pi} \xcancel{\sin x} \; dx$$

$$\sin x = 0 \qquad x = k\pi \qquad k \in \mathbb{Z}$$

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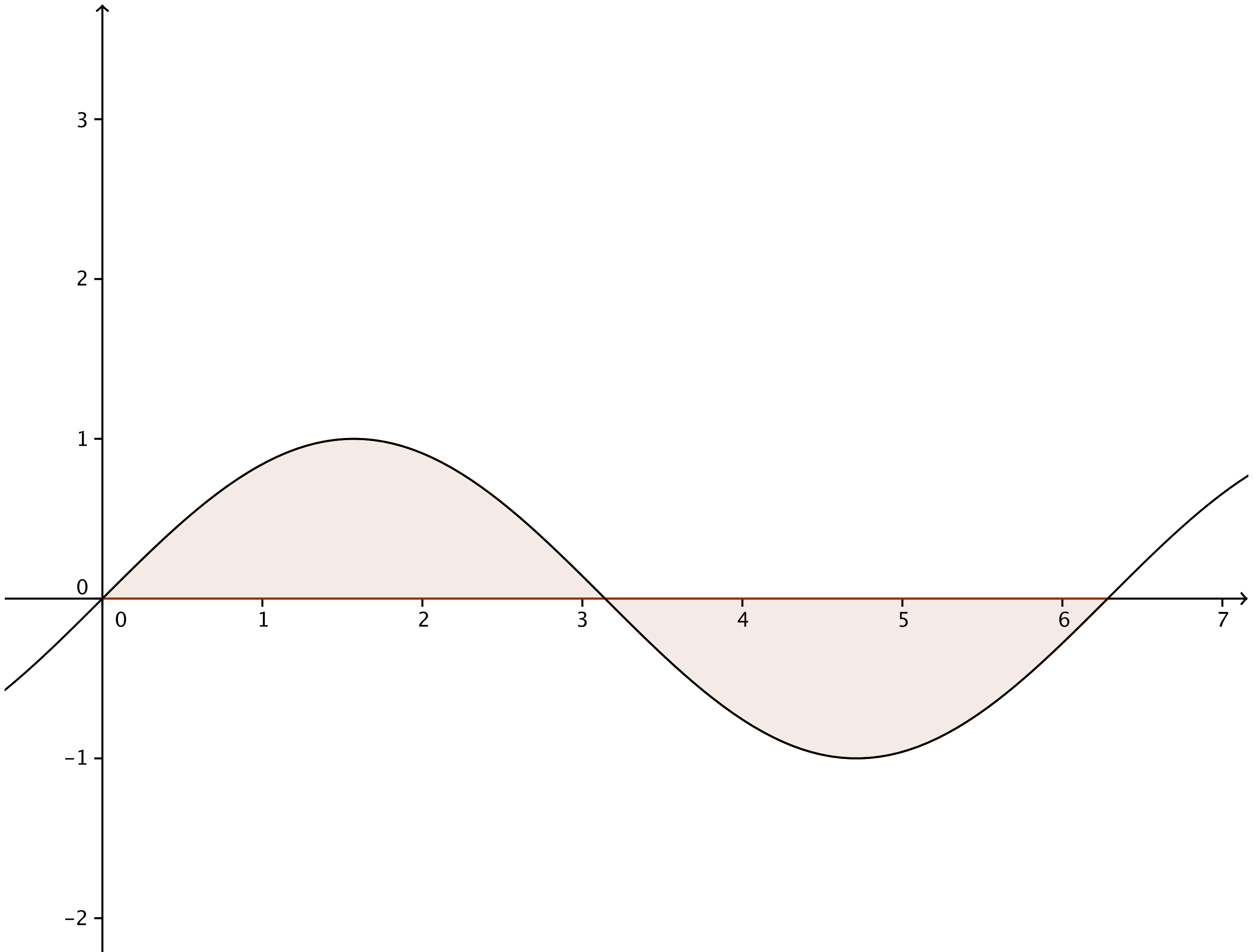

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$$x = 0, \pi, 2\pi$$

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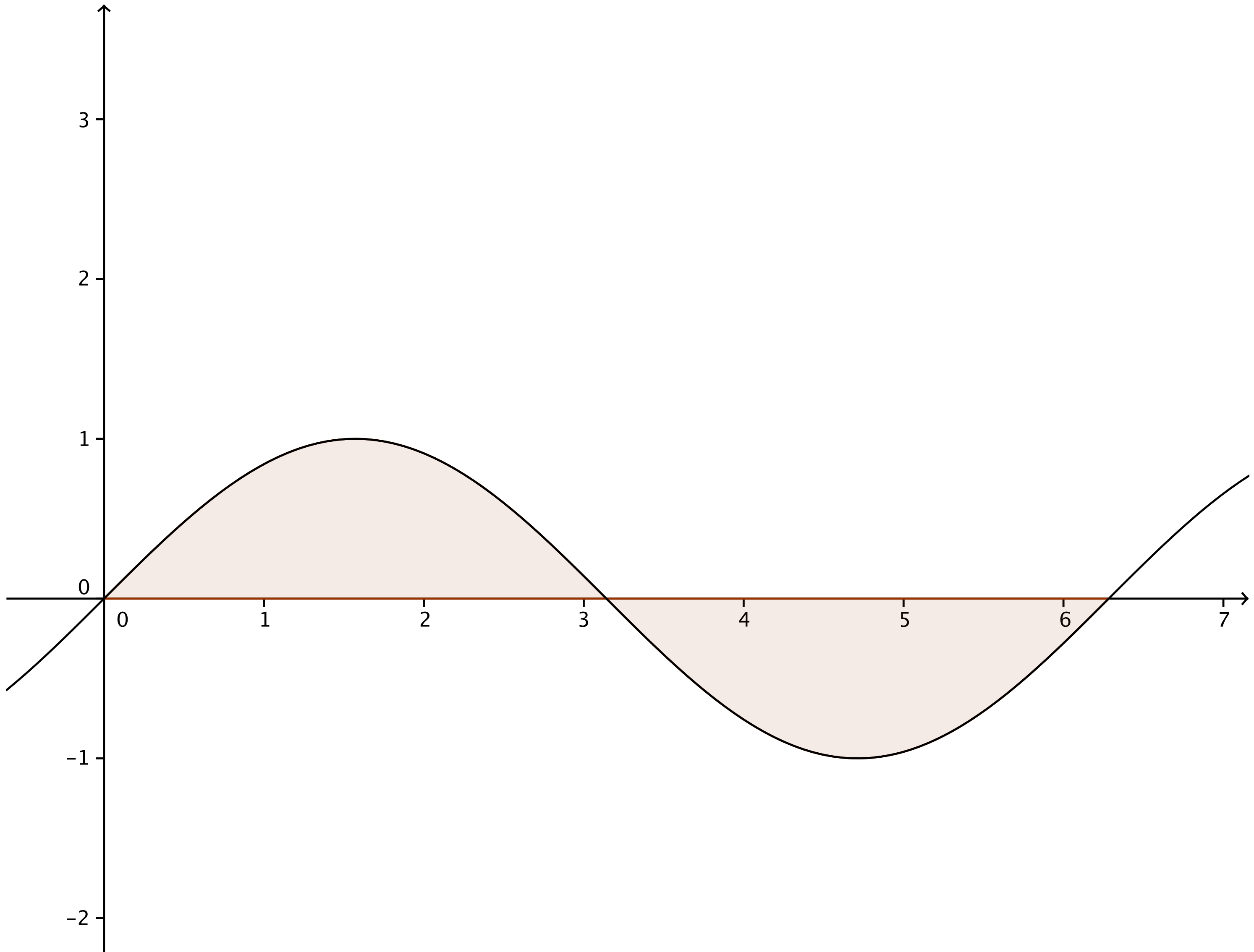

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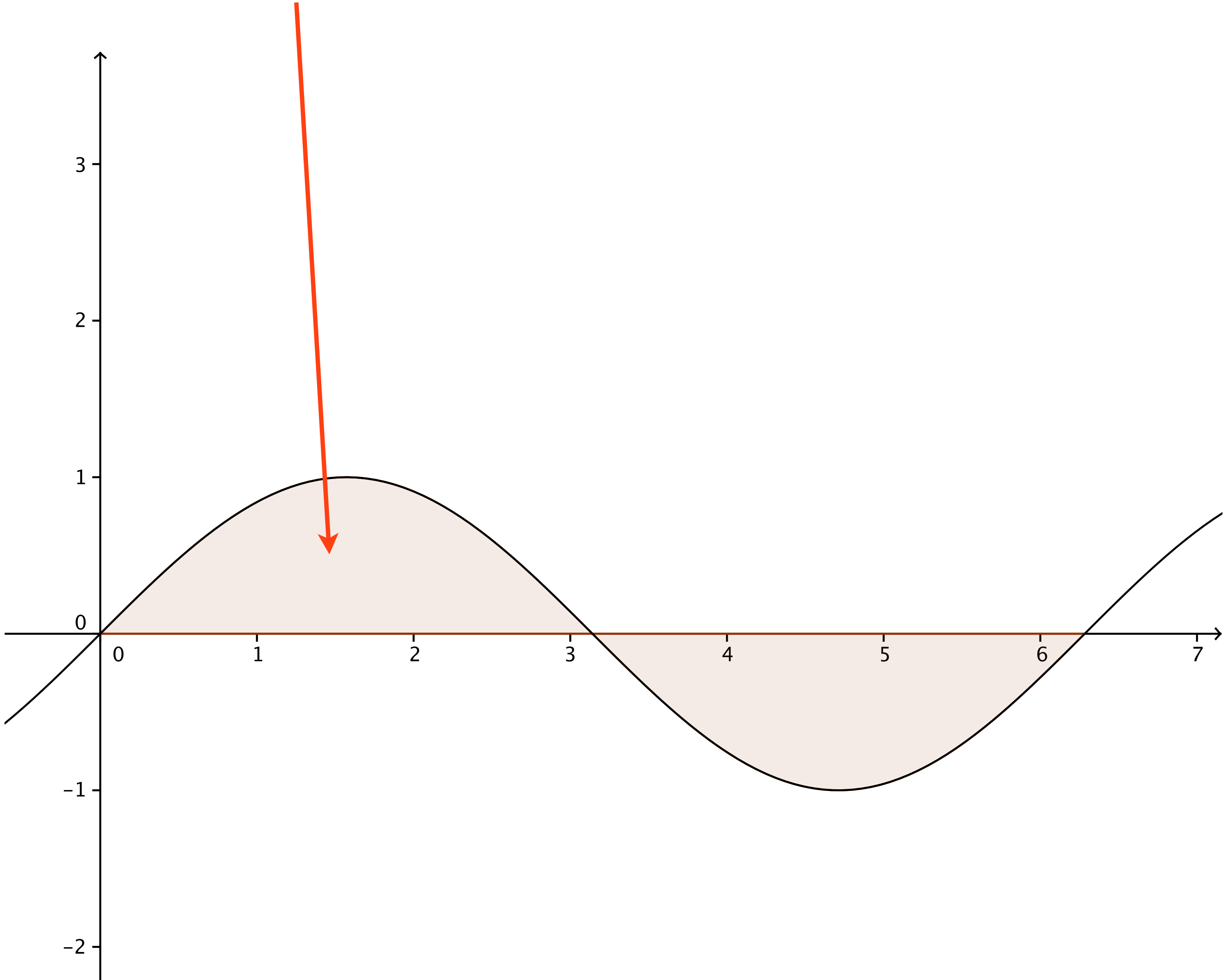

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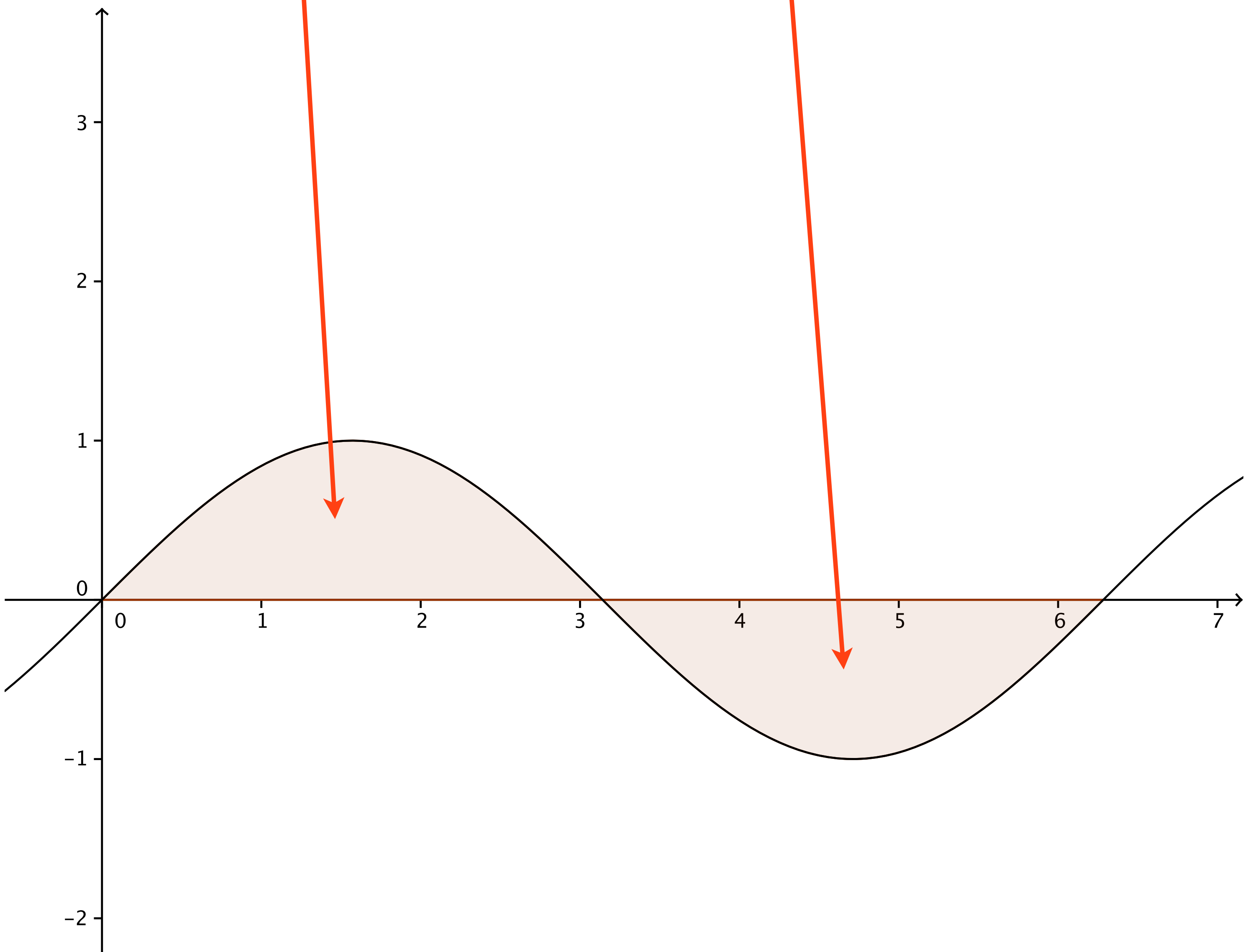

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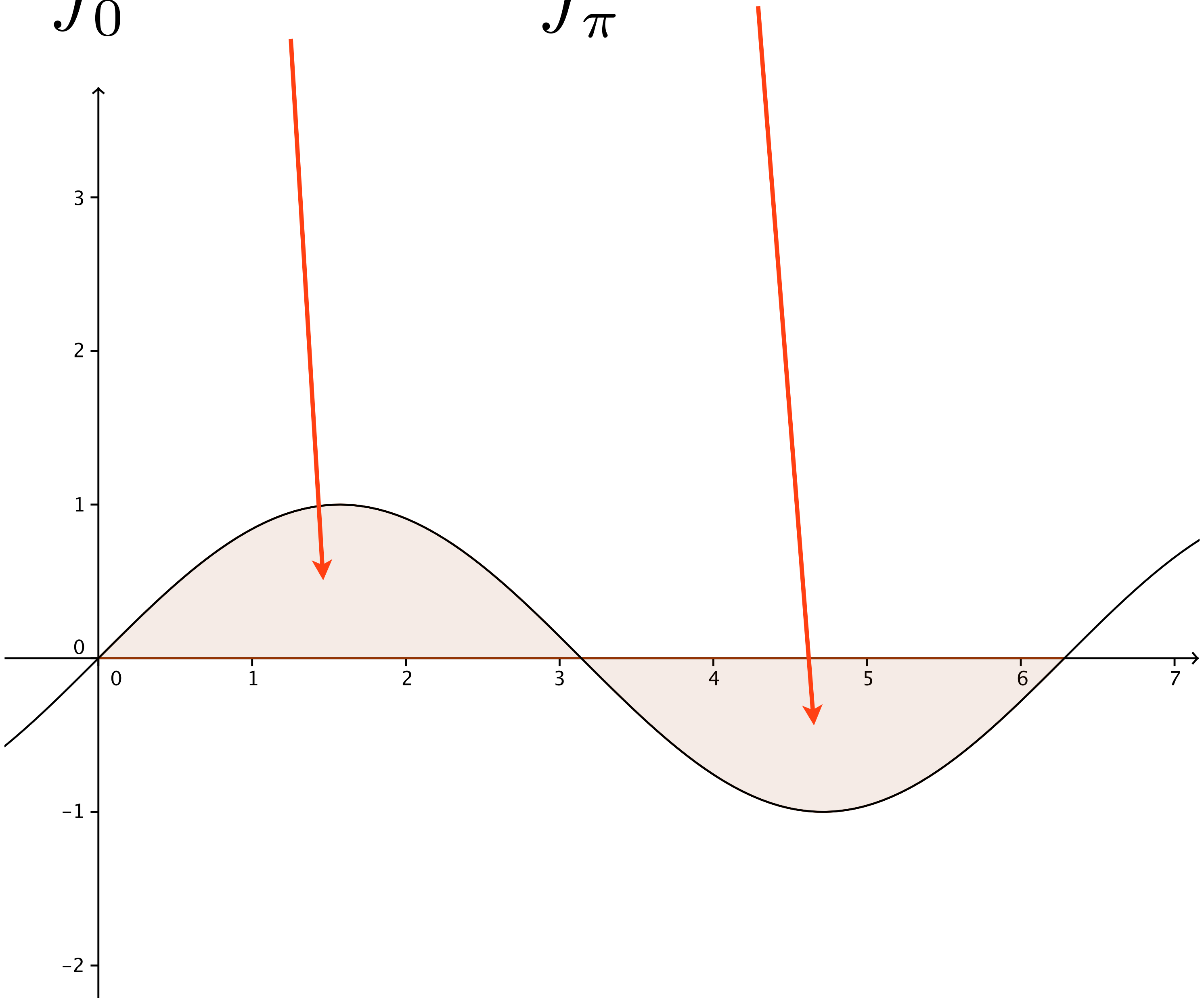

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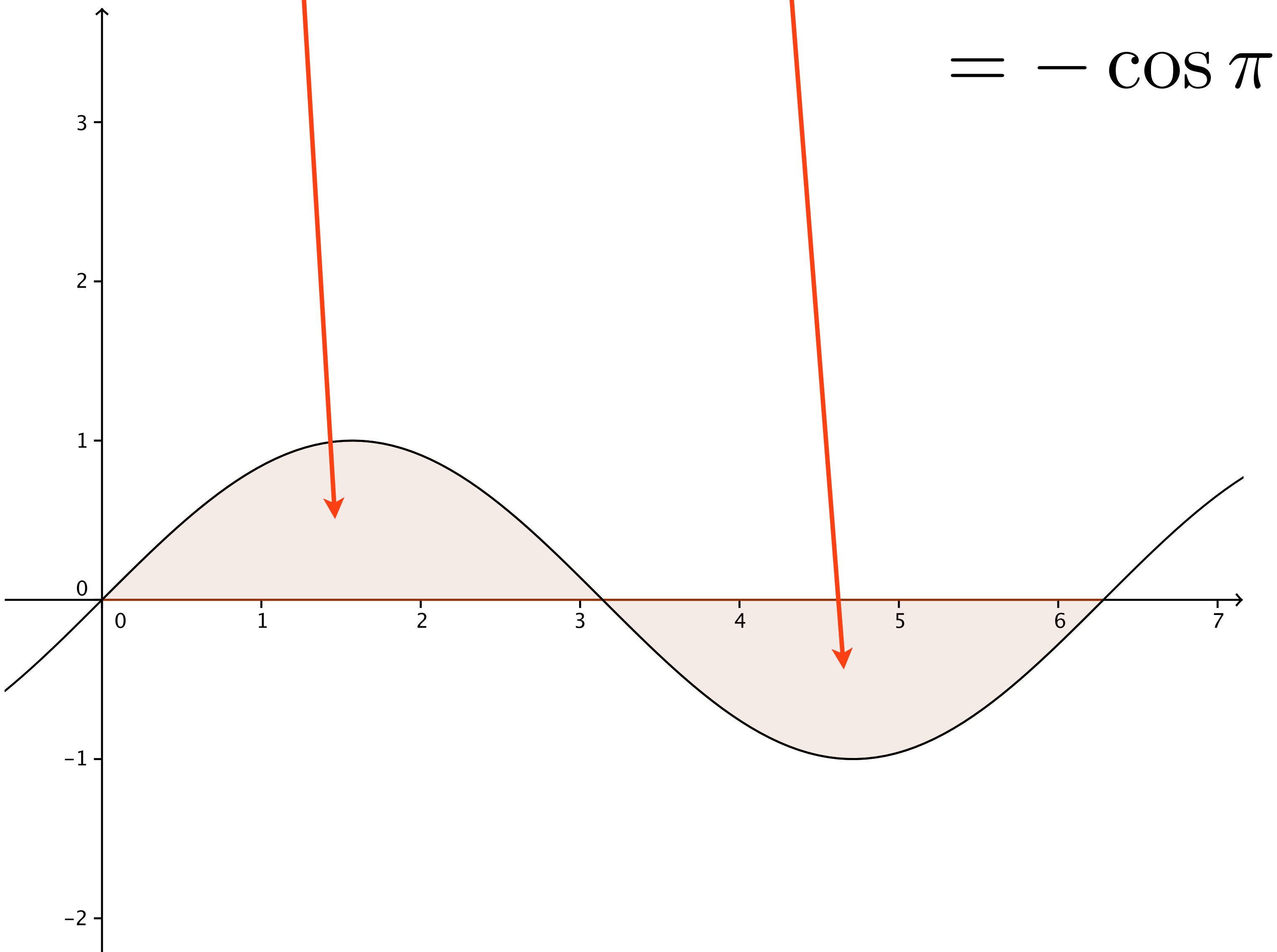

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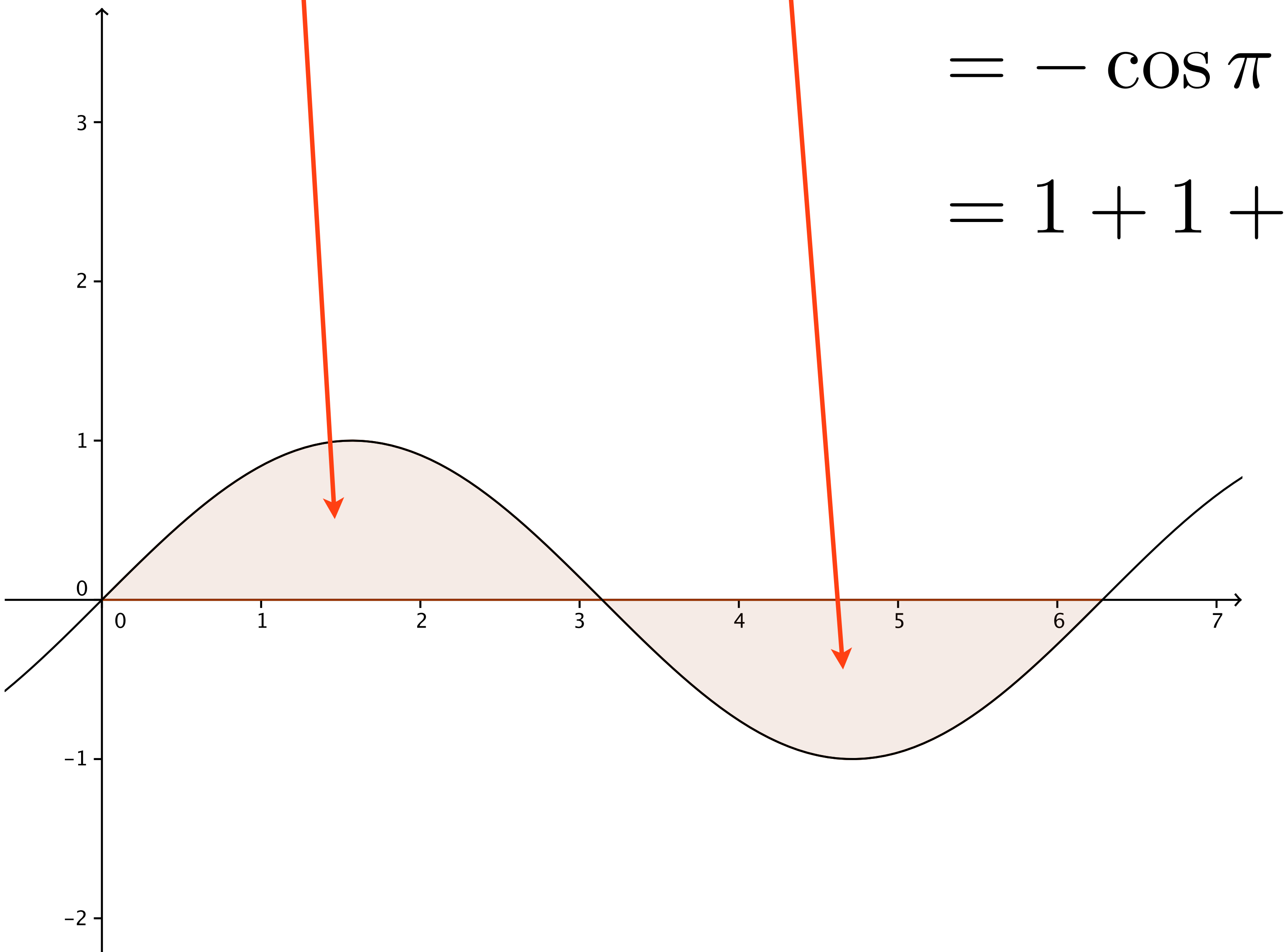

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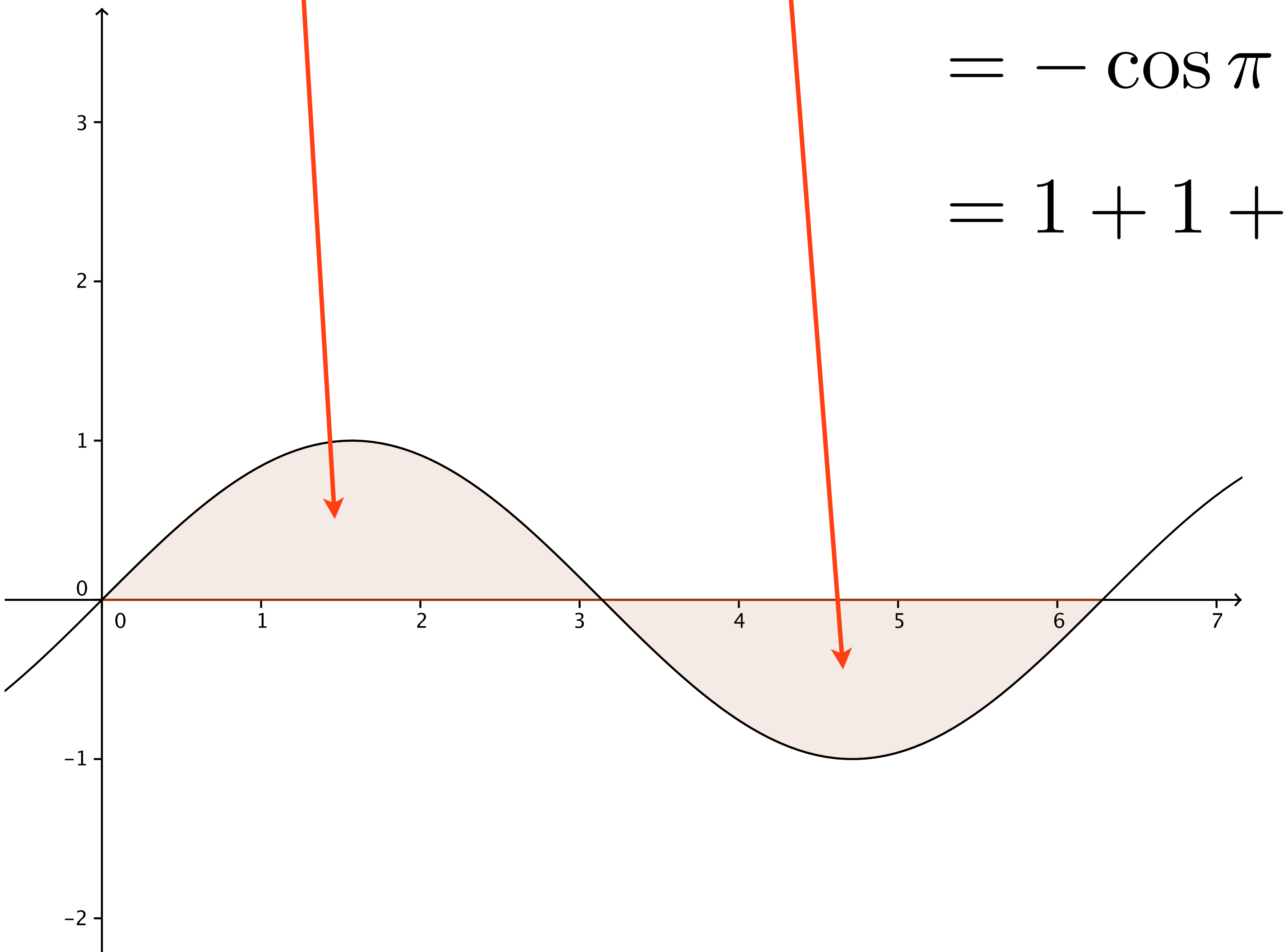

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Faites les exercices suivants

Section 1.6 # 37 a) et b)

Comment faire pour trouver l’aire comprise entre deux fonctions?

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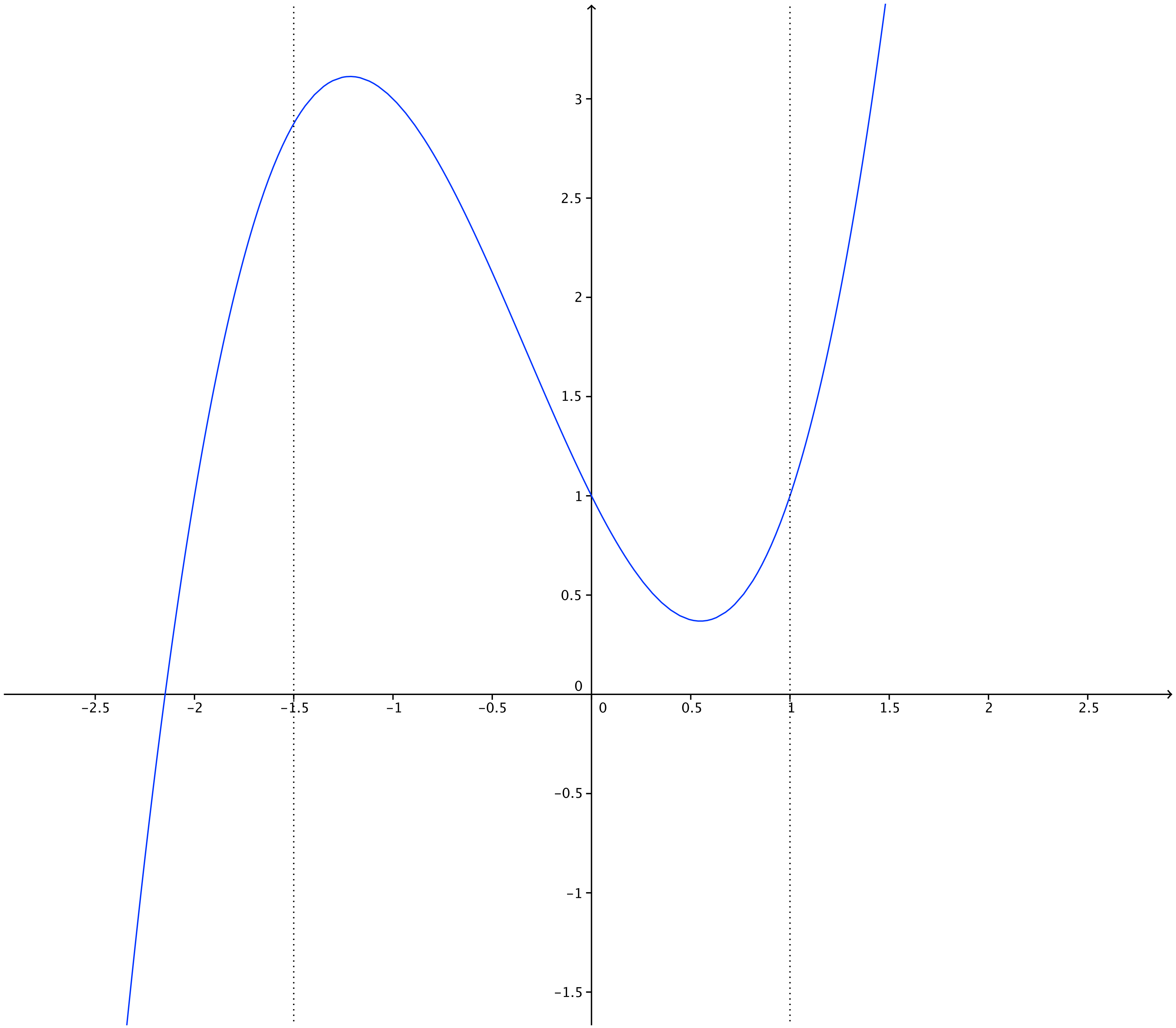

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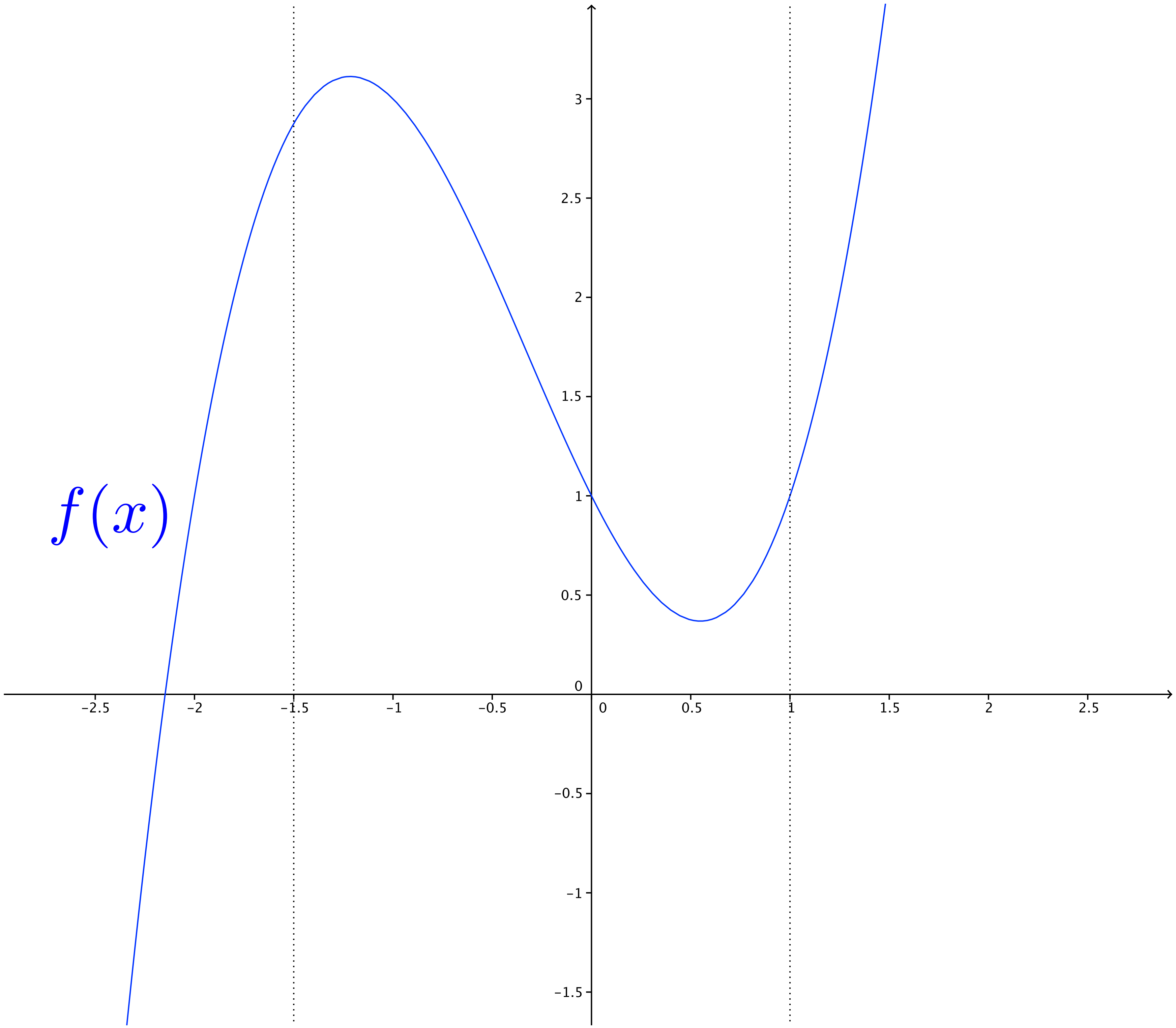

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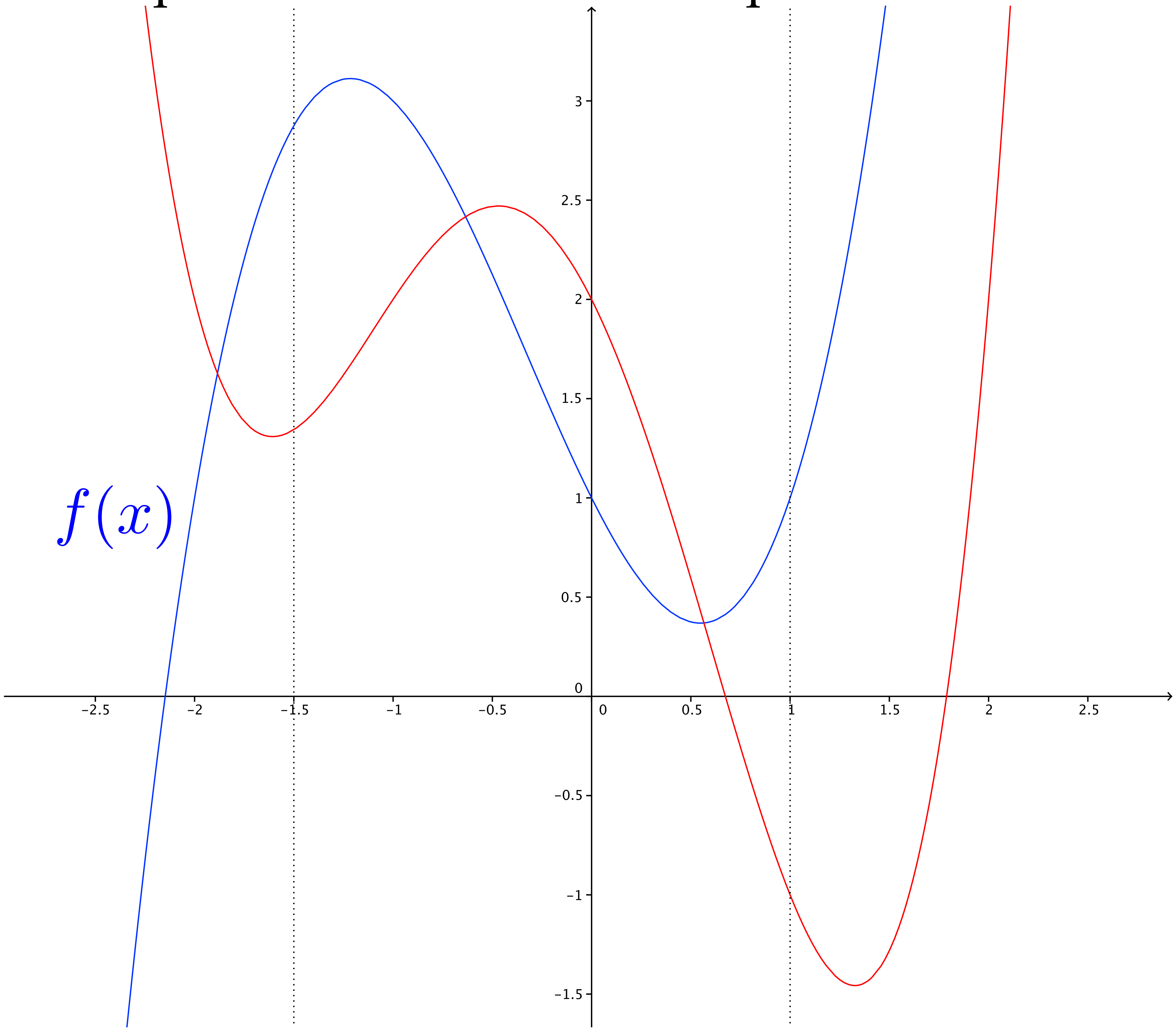

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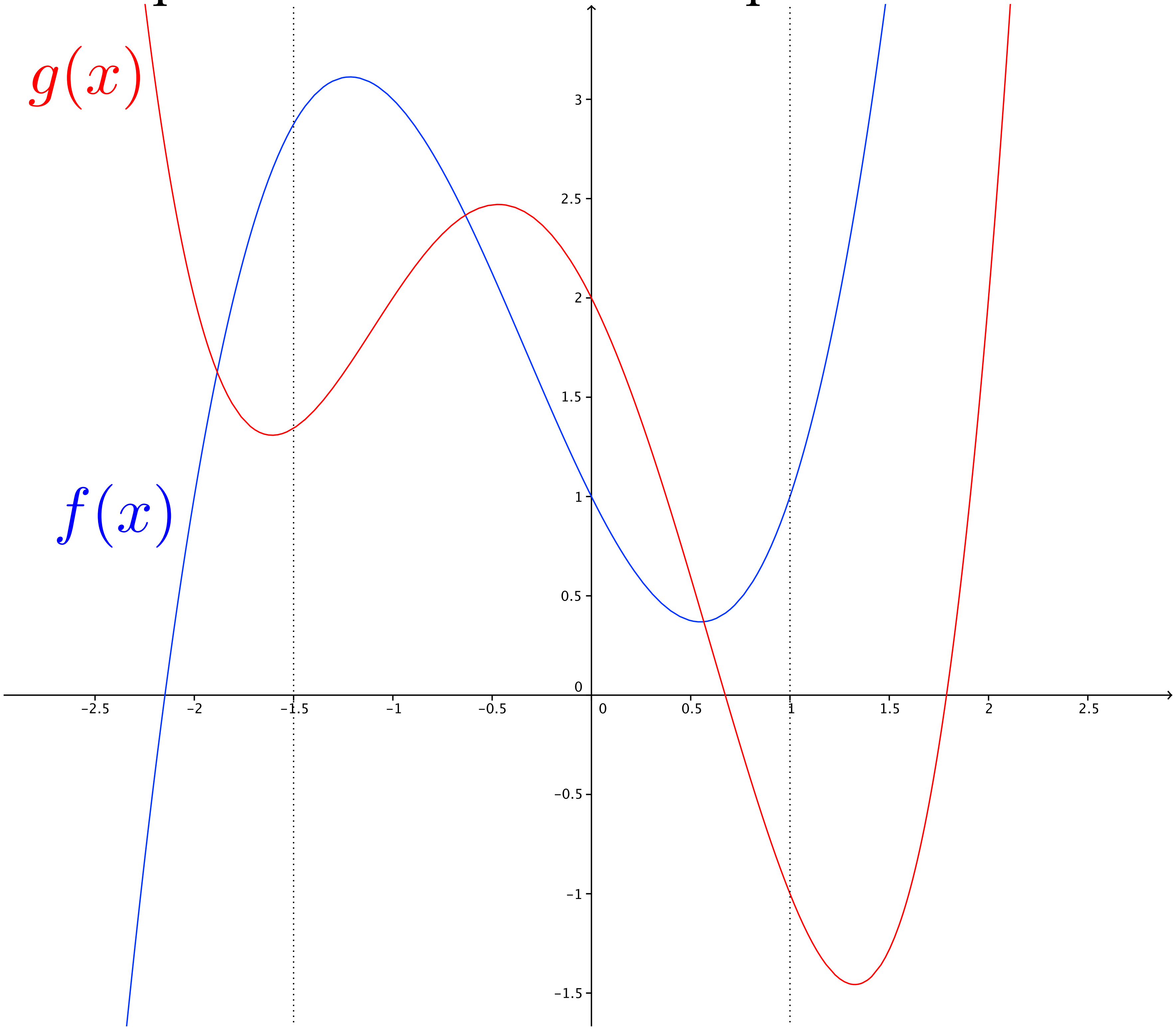

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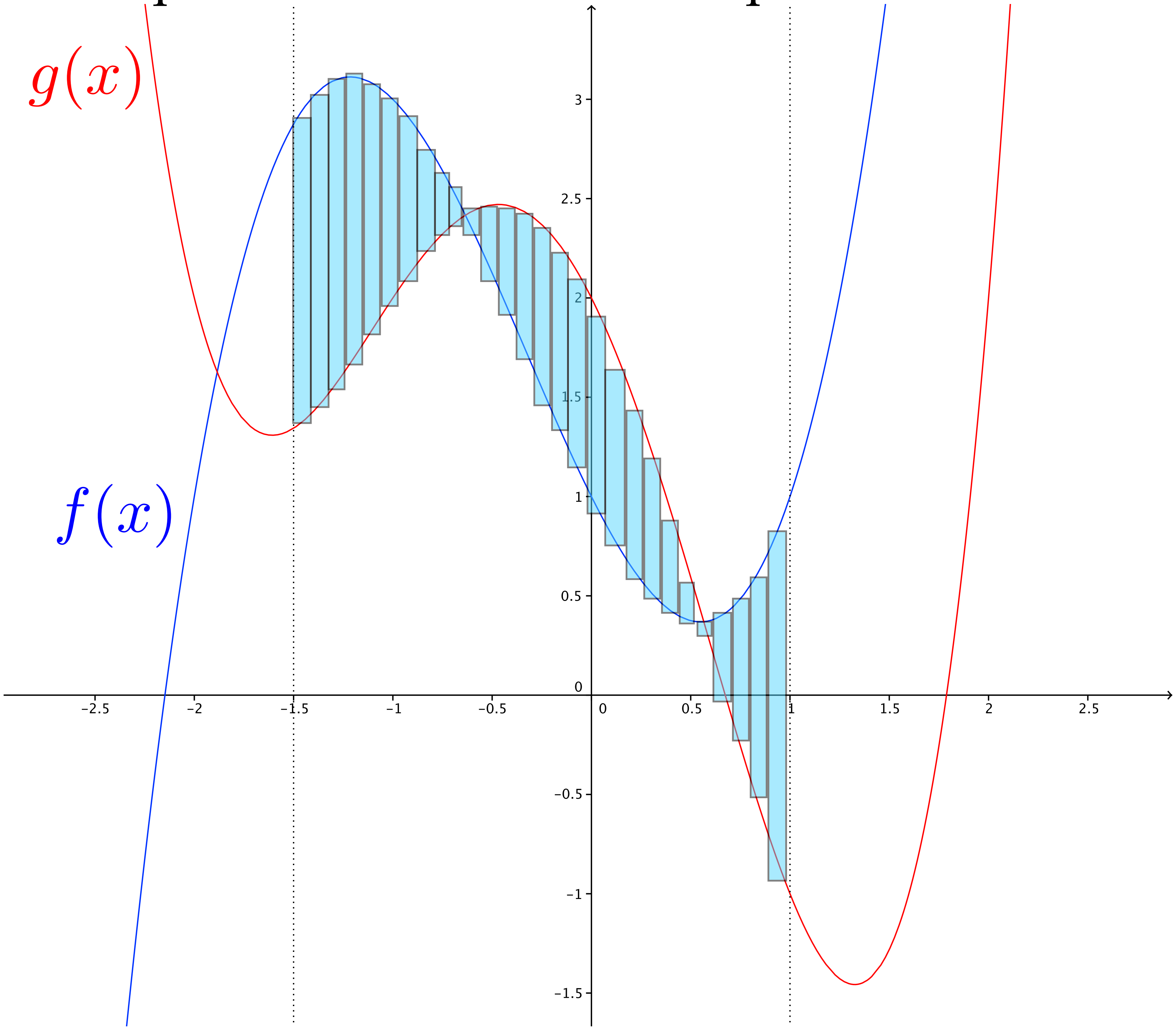

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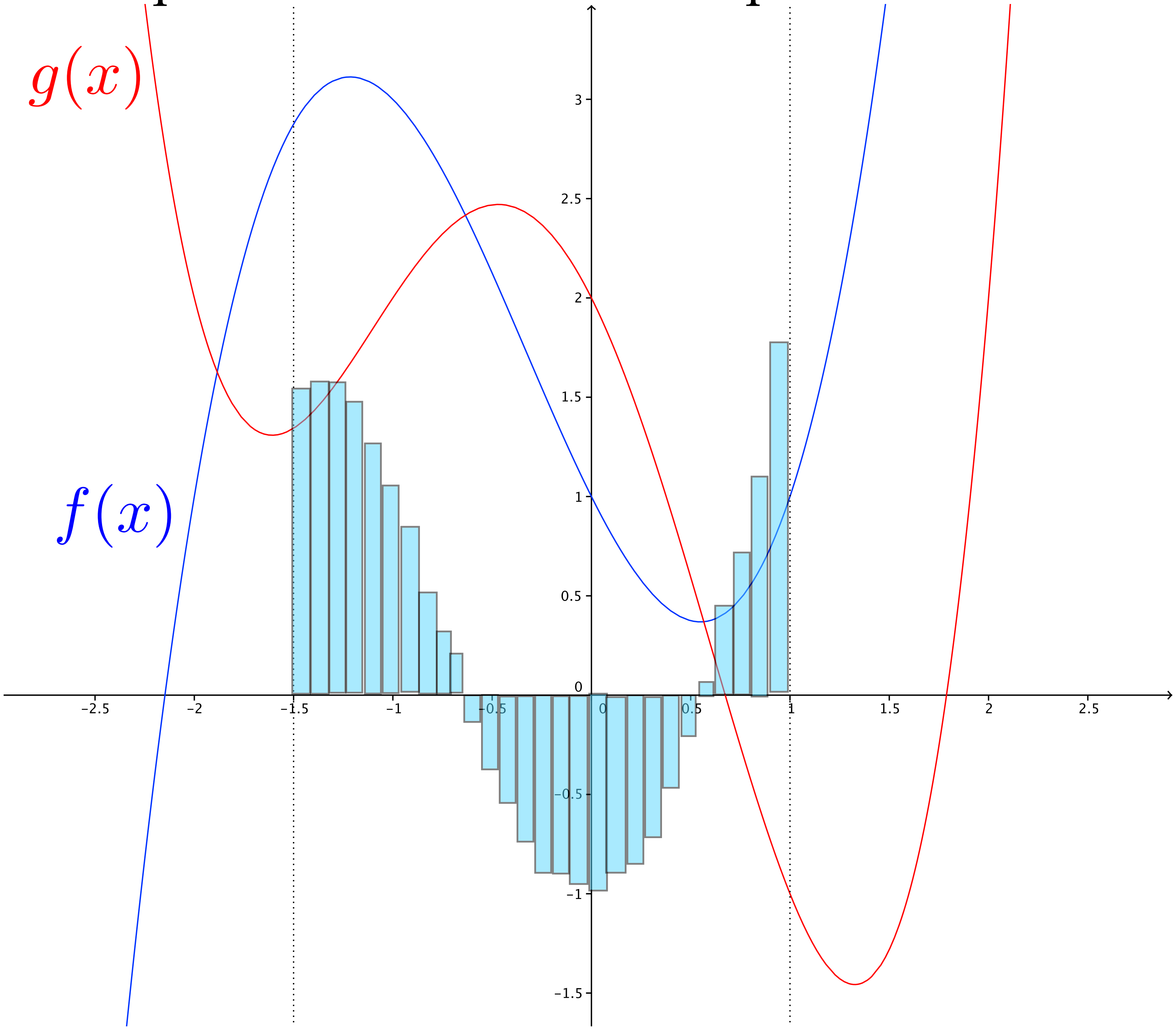

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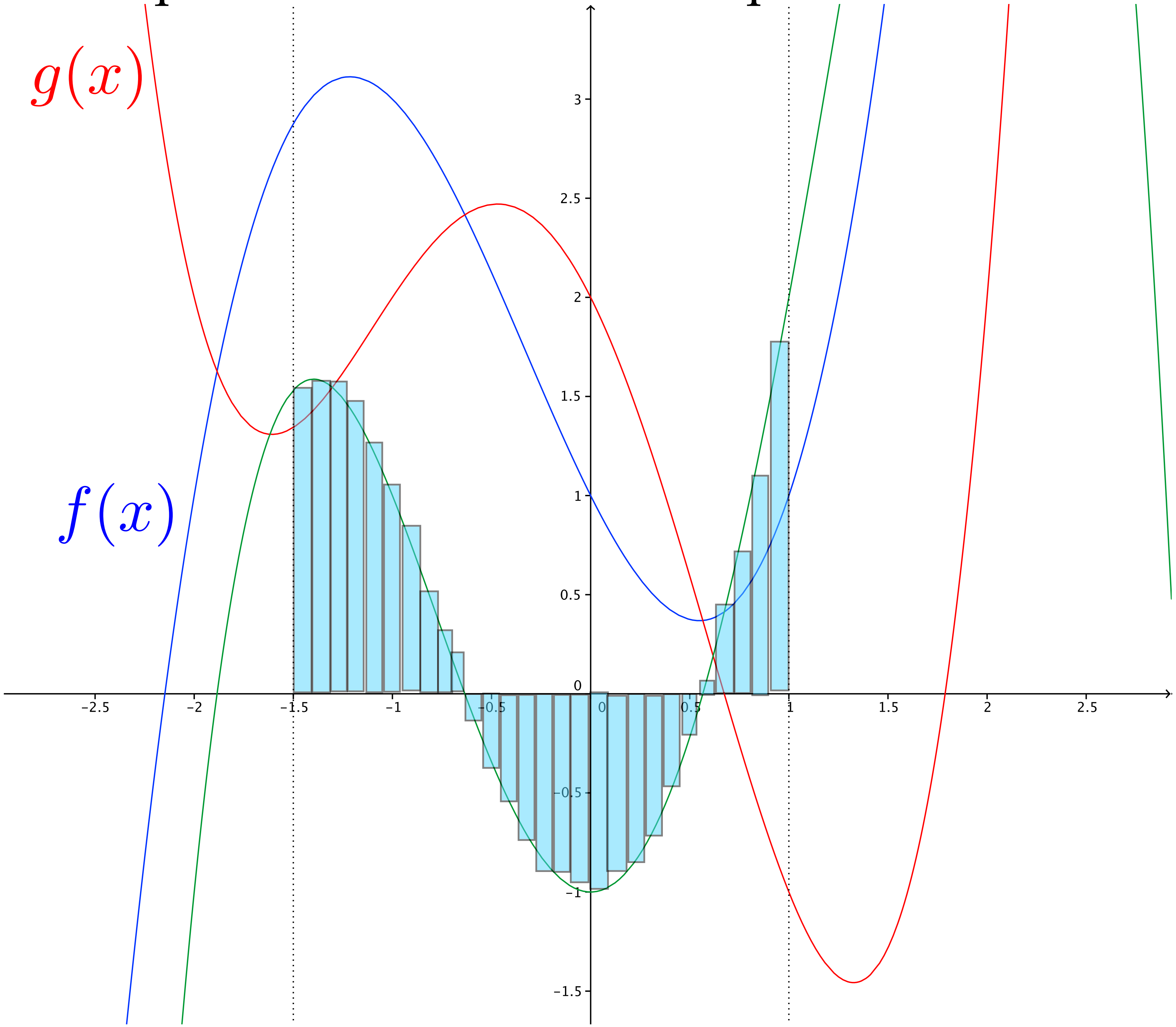

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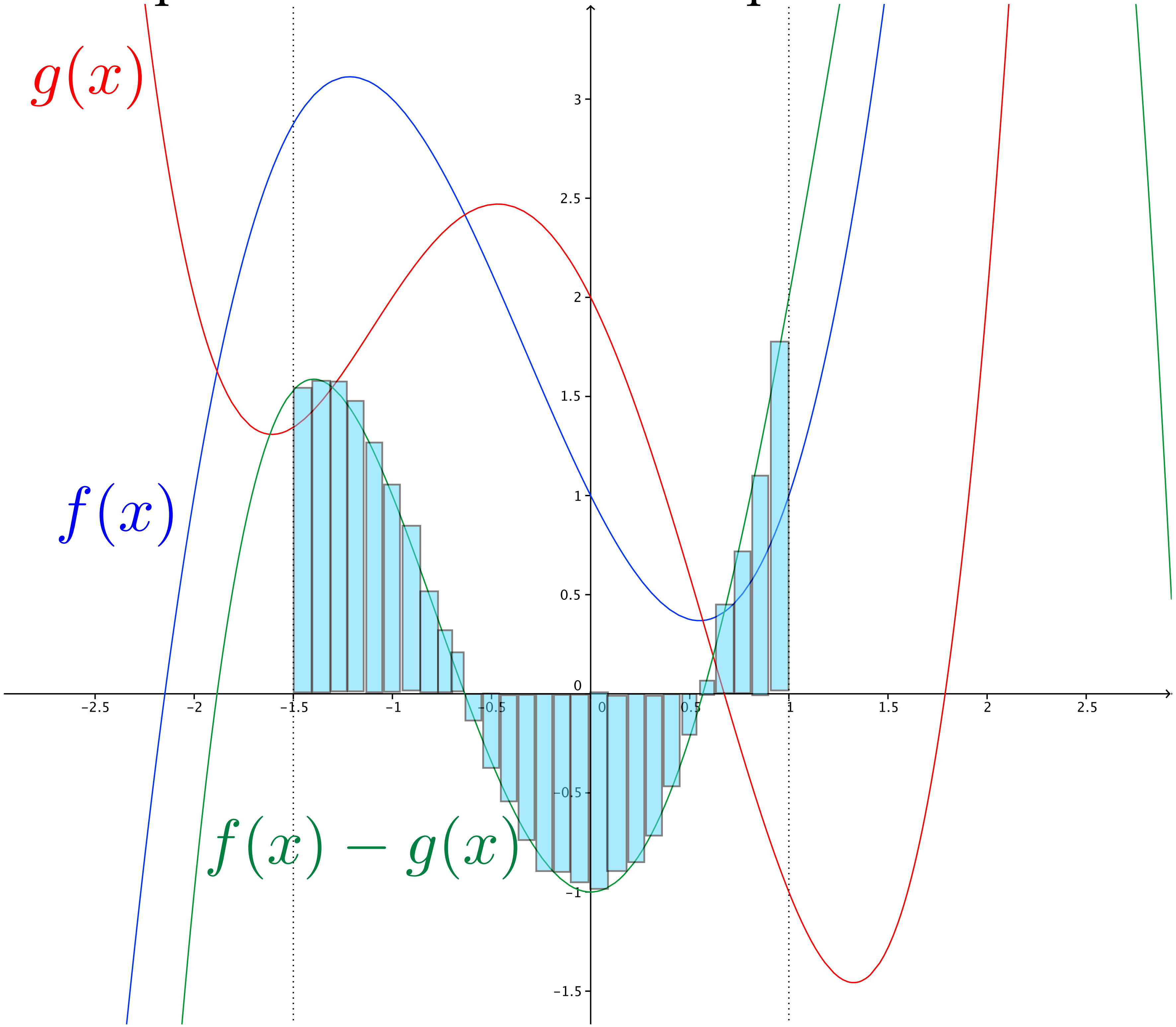

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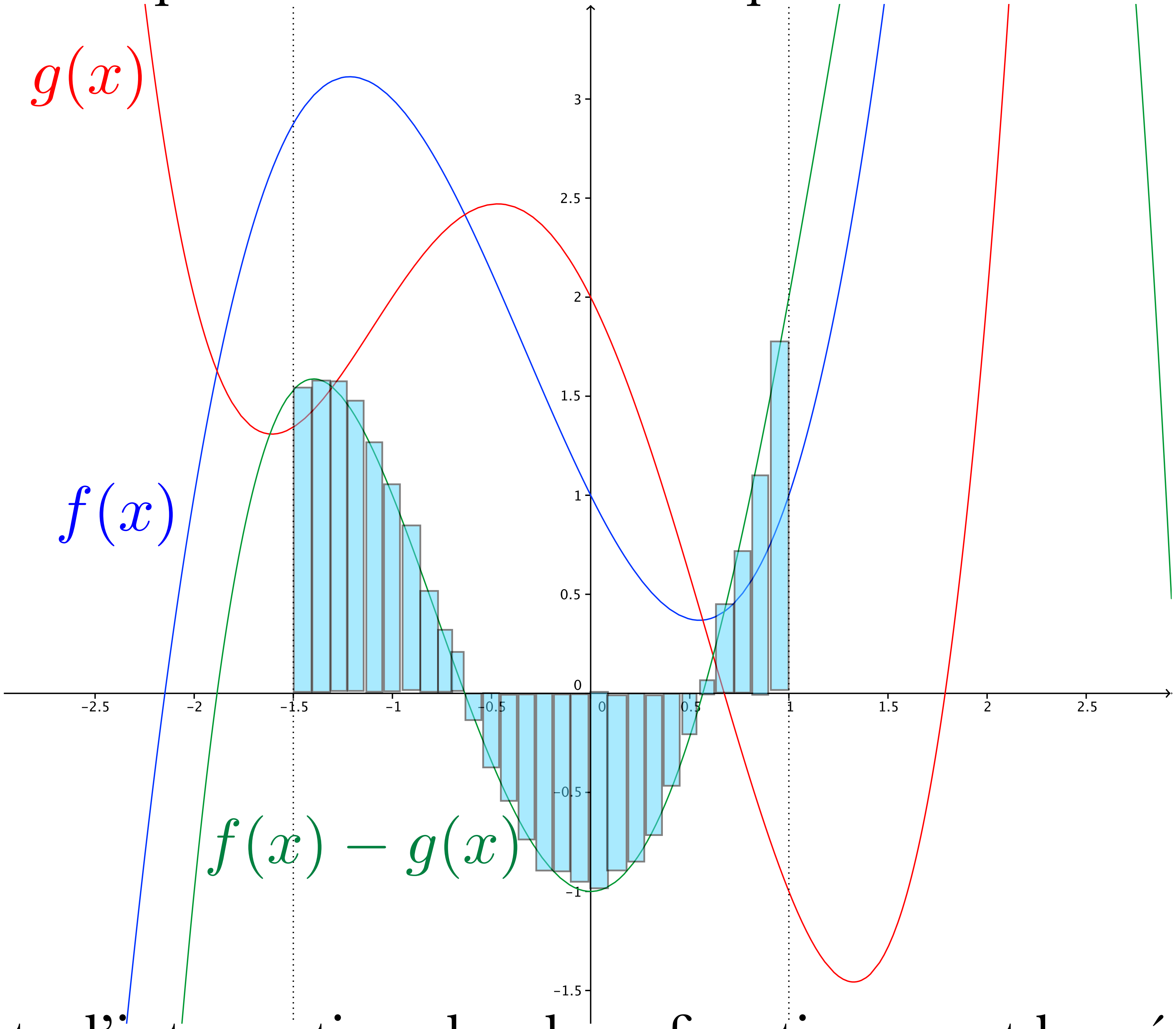

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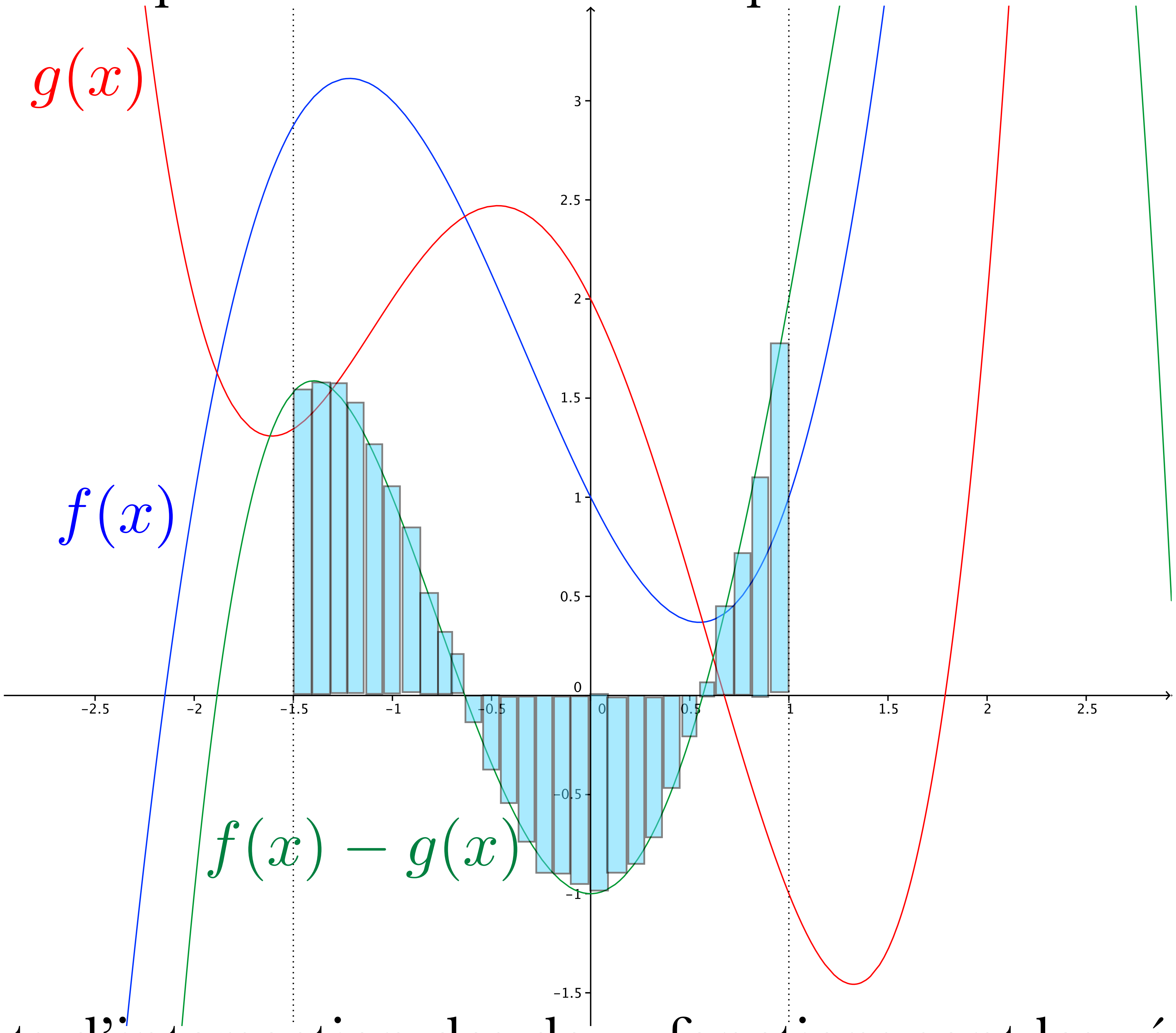

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On revient au cas qu’on a déjà traité.

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Calculer l'aire entre $f(x) = x^2 + 4x + 1$ et $g(x) = -x^2 + 2x + 5$ sur $[-3,2]$

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$$\left.\frac{2x^3}{3} + x^2 - 4x\right|_{-3}^{-2}$$

$$= \left(\frac{2(-2)^3}{3} + (-2)^2 - 4(-2)\right) - \left(\frac{2(-3)^3}{3} + (-3)^2 - 4(-3)\right)$$

$$\int 2x^2 + 2x - 4\ dx = \frac{2x^3}{3} + x^2 - 4x + C$$

Exemple

Calculer l'aire entre $f(x) = x^2 + 4x + 1$ et $g(x) = -x^2 + 2x + 5$ sur $[-3,2]$

$$\left|\int_{-3}^{-2} f(x) - g(x)\ dx\right| + \left|\int_{-2}^{1} f(x) - g(x)\ dx\right| + \left|\int_{1}^{2} f(x) - g(x)\ dx\right|$$

$$\left.\frac{2x^3}{3} + x^2 - 4x\right|_{-3}^{-2}$$

$$= \left(\frac{2(-2)^3}{3} + (-2)^2 - 4(-2)\right) - \left(\frac{2(-3)^3}{3} + (-3)^2 - 4(-3)\right)$$

$$= \left(-\frac{16}{3} + 4 + 8\right) - (-18 + 9 + 12)$$

$$\int 2x^2 + 2x - 4\ dx = \frac{2x^3}{3} + x^2 - 4x + C$$

Exemple

Calculer l'aire entre $f(x) = x^2 + 4x + 1$ et $g(x) = -x^2 + 2x + 5$ sur $[-3{,}2]$

$$\left|\int_{-3}^{-2} f(x) - g(x)\ dx\right| + \left|\int_{-2}^{1} f(x) - g(x)\ dx\right| + \left|\int_{1}^{2} f(x) - g(x)\ dx\right|$$

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$$= \left(\frac{2(-2)^3}{3} + (-2)^2 - 4(-2)\right) - \left(\frac{2(-3)^3}{3} + (-3)^2 - 4(-3)\right)$$

$$= \left(-\frac{16}{3} + 4 + 8\right) - (-18 + 9 + 12) \quad = \left(\frac{20}{3}\right) - (3)$$

$$\int 2x^2 + 2x - 4\ dx \ = \frac{2x^3}{3} + x^2 - 4x + C$$

Exemple

Calculer l'aire entre $f(x) = x^2 + 4x + 1$ et $g(x) = -x^2 + 2x + 5$ sur $[-3,2]$

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$$\frac{2x^3}{3} + x^2 - 4x\Big|_{-3}^{-2} = \left(\frac{20}{3}\right) - (3)$$

Exemple

Calculer l'aire entre $f(x) = x^2 + 4x + 1$ et $g(x) = -x^2 + 2x + 5$ sur $[-3,2]$

$$\left|\int_{-3}^{-2} f(x) - g(x)\ dx\right| + \left|\int_{-2}^{1} f(x) - g(x)\ dx\right| + \left|\int_{1}^{2} f(x) - g(x)\ dx\right|$$

$$\frac{2x^3}{3} + x^2 - 4x\Big|_{-3}^{-2} = \left(\frac{20}{3}\right) - (3)$$

$$\frac{2x^3}{3} + x^2 - 4x\Big|_{-2}^{1}$$

Exemple

Calculer l'aire entre $f(x) = x^2 + 4x + 1$ et $g(x) = -x^2 + 2x + 5$ sur $[-3,2]$

$$\left|\int_{-3}^{-2} f(x) - g(x)\ dx\right| + \left|\int_{-2}^{1} f(x) - g(x)\ dx\right| + \left|\int_{1}^{2} f(x) - g(x)\ dx\right|$$

$$\frac{2x^3}{3} + x^2 - 4x\Big|_{-3}^{-2} = \left(\frac{20}{3}\right) - (3)$$

$$\frac{2x^3}{3} + x^2 - 4x\Big|_{-2}^{1} = \left(\frac{2}{3} + 1 - 4\right) - \left(\frac{20}{3}\right)$$

Exemple

Calculer l'aire entre $f(x) = x^2 + 4x + 1$ et $g(x) = -x^2 + 2x + 5$ sur $[-3,2]$

$$\left|\int_{-3}^{-2} f(x) - g(x)\ dx\right| + \left|\int_{-2}^{1} f(x) - g(x)\ dx\right| + \left|\int_{1}^{2} f(x) - g(x)\ dx\right|$$

$$\left.\frac{2x^3}{3} + x^2 - 4x\right|_{-3}^{-2} = \left(\frac{20}{3}\right) - (3)$$

$$\left.\frac{2x^3}{3} + x^2 - 4x\right|_{-2}^{1} = \left(\frac{2}{3} + 1 - 4\right) - \left(\frac{20}{3}\right) = \left(-\frac{7}{3}\right) - \left(\frac{20}{3}\right)$$

Exemple

Calculer l'aire entre $f(x) = x^2 + 4x + 1$ et $g(x) = -x^2 + 2x + 5$ sur $[-3,2]$

$$\left|\int_{-3}^{-2} f(x) - g(x)\ dx\right| + \left|\int_{-2}^{1} f(x) - g(x)\ dx\right| + \left|\int_{1}^{2} f(x) - g(x)\ dx\right|$$

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Exemple

Calculer l'aire entre $f(x) = x^2 + 4x + 1$ et $g(x) = -x^2 + 2x + 5$ sur $[-3,2]$

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$$\frac{2x^3}{3} + x^2 - 4x\Big|_{-3}^{-2} = \left(\frac{20}{3}\right) - (3)$$

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$$\frac{2x^3}{3} + x^2 - 4x\Big|_{1}^{2}$$

Exemple

Calculer l'aire entre $f(x) = x^2 + 4x + 1$ et $g(x) = -x^2 + 2x + 5$ sur $[-3,2]$

$$\left|\int_{-3}^{-2} f(x) - g(x)\ dx\right| + \left|\int_{-2}^{1} f(x) - g(x)\ dx\right| + \left|\int_{1}^{2} f(x) - g(x)\ dx\right|$$

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Exemple

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$$\frac{2x^3}{3} + x^2 - 4x\Big|_{-3}^{-2} = \left(\frac{20}{3}\right) - (3)$$

$$\frac{2x^3}{3} + x^2 - 4x\Big|_{-2}^{1} = \left(-\frac{7}{3}\right) - \left(\frac{20}{3}\right)$$

$$\frac{2x^3}{3} + x^2 - 4x\Big|_{1}^{2} = \left(\frac{16}{3} + 4 - 8\right) - \left(-\frac{7}{3}\right) = \left(\frac{4}{3}\right) - \left(-\frac{7}{3}\right)$$

Exemple

Calculer l'aire entre $f(x) = x^2 + 4x + 1$ et

$g(x) = -x^2 + 2x + 5$ sur $[-3,2]$

$$\left|\int_{-3}^{-2} f(x) - g(x)\ dx\right| + \left|\int_{-2}^{1} f(x) - g(x)\ dx\right| + \left|\int_{1}^{2} f(x) - g(x)\ dx\right|$$

$$\frac{2x^3}{3} + x^2 - 4x\Big|_{-3}^{-2} = \left(\frac{20}{3}\right) - (3)$$

$$\frac{2x^3}{3} + x^2 - 4x\Big|_{-2}^{1} = \left(-\frac{7}{3}\right) - \left(\frac{20}{3}\right)$$

$$\frac{2x^3}{3} + x^2 - 4x\Big|_{1}^{2} = \left(\frac{4}{3}\right) - \left(-\frac{7}{3}\right)$$

Exemple

Calculer l'aire entre $f(x) = x^2 + 4x + 1$ et $g(x) = -x^2 + 2x + 5$ sur $[-3,2]$

$$\left|\int_{-3}^{-2} f(x) - g(x)\ dx\right| + \left|\int_{-2}^{1} f(x) - g(x)\ dx\right| + \left|\int_{1}^{2} f(x) - g(x)\ dx\right|$$

$$\frac{2x^3}{3} + x^2 - 4x\Big|_{-3}^{-2} = \left(\frac{20}{3}\right) - (3) = \frac{11}{3}$$

$$\frac{2x^3}{3} + x^2 - 4x\Big|_{-2}^{1} = \left(-\frac{7}{3}\right) - \left(\frac{20}{3}\right)$$

$$\frac{2x^3}{3} + x^2 - 4x\Big|_{1}^{2} = \left(\frac{4}{3}\right) - \left(-\frac{7}{3}\right)$$

Exemple

Calculer l'aire entre $f(x) = x^2 + 4x + 1$ et $g(x) = -x^2 + 2x + 5$ sur $[-3,2]$

$$\left|\int_{-3}^{-2} f(x) - g(x)\ dx\right| + \left|\int_{-2}^{1} f(x) - g(x)\ dx\right| + \left|\int_{1}^{2} f(x) - g(x)\ dx\right|$$

$$\frac{2x^3}{3} + x^2 - 4x\Big|_{-3}^{-2} = \left(\frac{20}{3}\right) - (3) = \frac{11}{3}$$

$$\frac{2x^3}{3} + x^2 - 4x\Big|_{-2}^{1} = \left(-\frac{7}{3}\right) - \left(\frac{20}{3}\right) = -\frac{27}{3}$$

$$\frac{2x^3}{3} + x^2 - 4x\Big|_{1}^{2} = \left(\frac{4}{3}\right) - \left(-\frac{7}{3}\right)$$

Exemple

Calculer l'aire entre $f(x) = x^2 + 4x + 1$ et $g(x) = -x^2 + 2x + 5$ sur $[-3,2]$

$$\left|\int_{-3}^{-2} f(x) - g(x)\ dx\right| + \left|\int_{-2}^{1} f(x) - g(x)\ dx\right| + \left|\int_{1}^{2} f(x) - g(x)\ dx\right|$$

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$$\frac{2x^3}{3} + x^2 - 4x\Big|_{1}^{2} = \left(\frac{4}{3}\right) - \left(-\frac{7}{3}\right) = \frac{11}{3}$$

Exemple

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$$\text{Aire} = \left|\frac{11}{3}\right| + \left|-\frac{27}{3}\right| + \left|\frac{11}{3}\right|$$

Exemple

Calculer l'aire entre $f(x) = x^2 + 4x + 1$ et $g(x) = -x^2 + 2x + 5$ sur $[-3,2]$

$$\left|\int_{-3}^{-2} f(x) - g(x)\ dx\right| + \left|\int_{-2}^{1} f(x) - g(x)\ dx\right| + \left|\int_{1}^{2} f(x) - g(x)\ dx\right|$$

$$\left.\frac{2x^3}{3} + x^2 - 4x\right|_{-3}^{-2} = \left(\frac{20}{3}\right) - (3) = \frac{11}{3}$$

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Exemple

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Exemple

Calculer l'aire entre $f(x) = x^2 + 4x + 1$ et $g(x) = -x^2 + 2x + 5$ sur $[-3,2]$

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Exemple

Calculer l'aire entre $f(x) = x^2 + 4x + 1$ et $g(x) = -x^2 + 2x + 5$ sur $[-3,2]$

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$$\text{Aire} = \left|\frac{11}{3}\right| + \left|-\frac{27}{3}\right| + \left|\frac{11}{3}\right| = \frac{49}{3}$$

Exemple

Calculer l’aire entre $f(x) = x^2 + 4x + 1$ et $g(x) = -x^2 + 2x + 5$ sur $[-3{,}2]$

$$\left|\int_{-3}^{-2} f(x) - g(x)\ dx\right| + \left|\int_{-2}^{1} f(x) - g(x)\ dx\right| + \left|\int_{1}^{2} f(x) - g(x)\ dx\right|$$

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Exemple

Calculer l'aire entre $f(x) = x^2 + 4x + 1$ et $g(x) = -x^2 + 2x + 5$ sur $[-3{,}2]$

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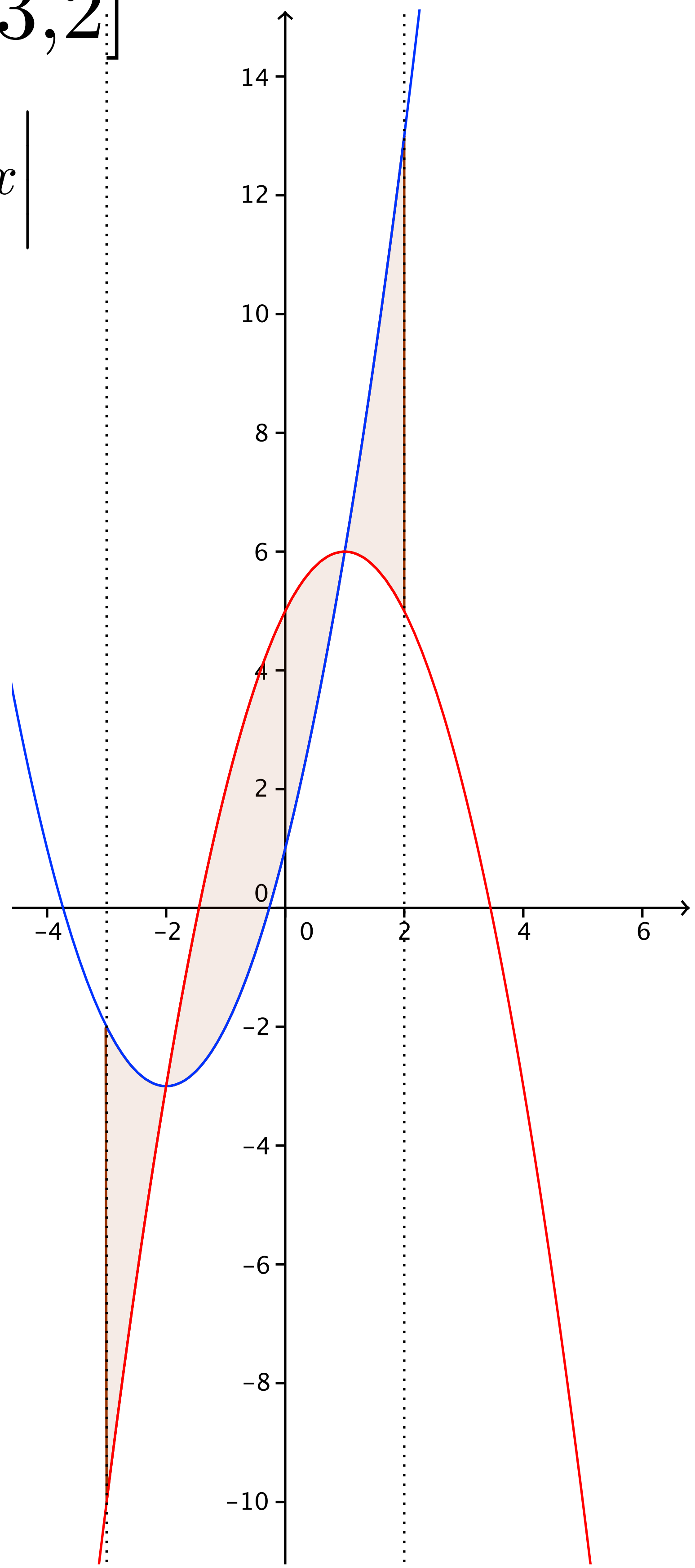
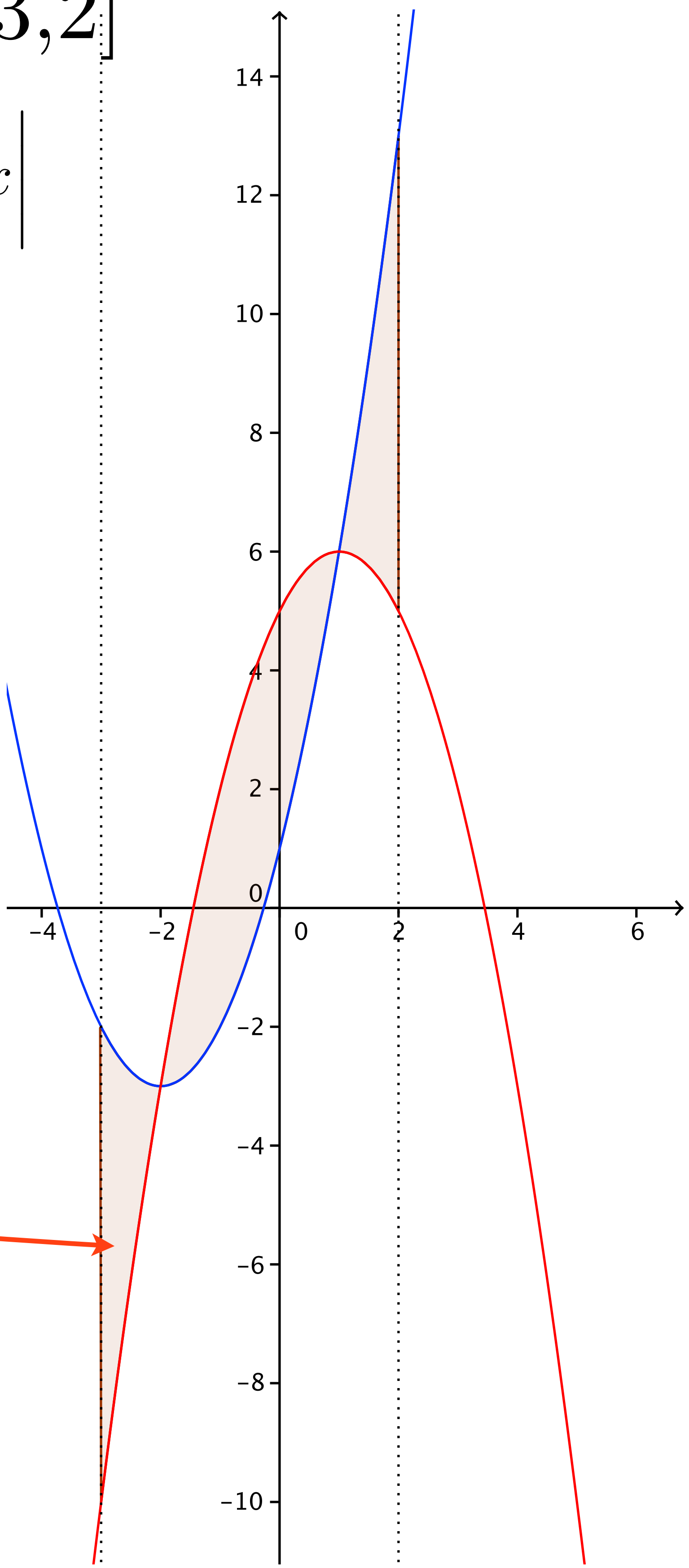


$$\text{Aire} = \left|\frac{11}{3}\right| + \left|-\frac{27}{3}\right| + \left|\frac{11}{3}\right| = \frac{49}{3}$$

Exemple

Calculer l'aire entre $f(x) = x^2 + 4x + 1$ et $g(x) = -x^2 + 2x + 5$ sur $[-3,2]$

$$\left|\int_{-3}^{-2} f(x) - g(x)\ dx\right| + \left|\int_{-2}^{1} f(x) - g(x)\ dx\right| + \left|\int_{1}^{2} f(x) - g(x)\ dx\right|$$



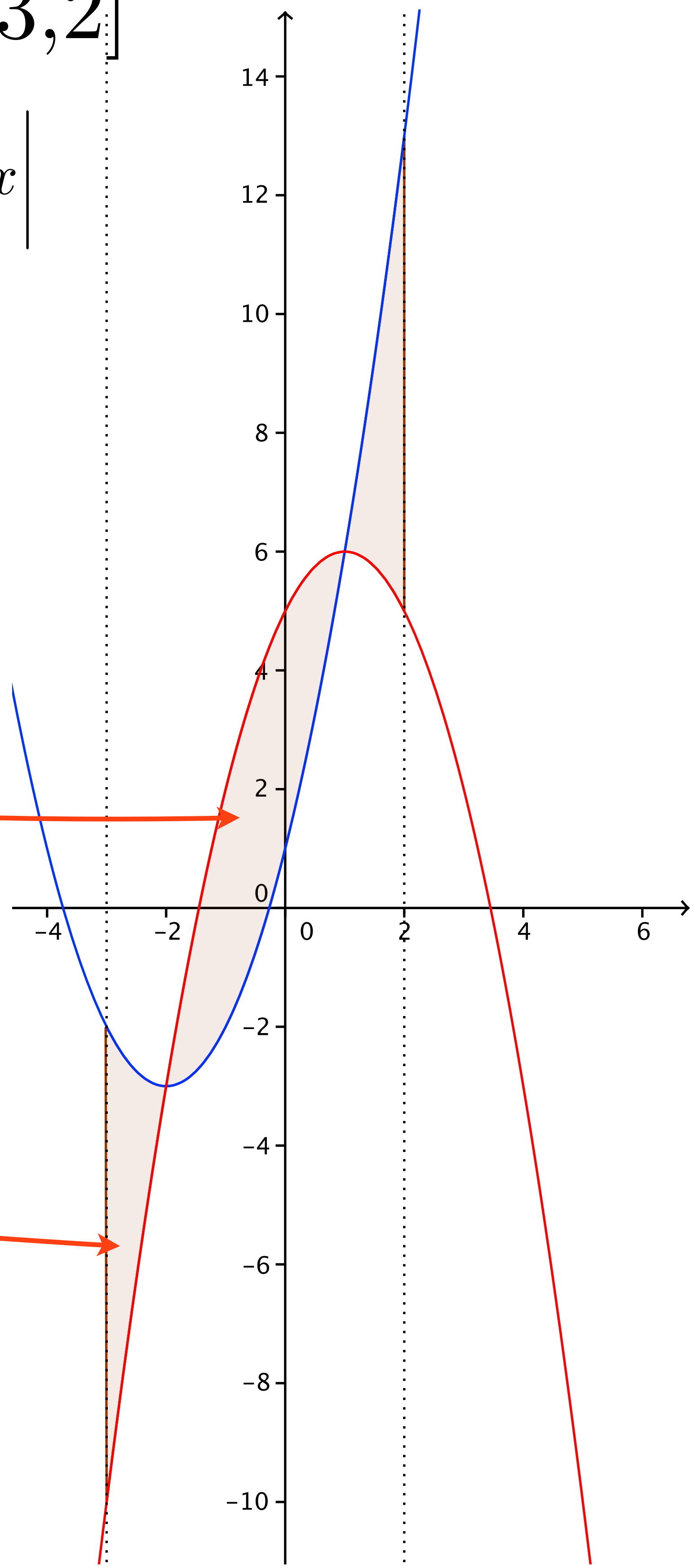
$$\text{Aire} = \left|\frac{11}{3}\right| + \left|-\frac{27}{3}\right| + \left|\frac{11}{3}\right| = \frac{49}{3}$$

Exemple

Calculer l'aire entre $f(x) = x^2 + 4x + 1$ et

$g(x) = -x^2 + 2x + 5$ sur $[-3,2]$

$$\left|\int_{-3}^{-2} f(x) - g(x)\ dx\right| + \left|\int_{-2}^{1} f(x) - g(x)\ dx\right| + \left|\int_{1}^{2} f(x) - g(x)\ dx\right|$$

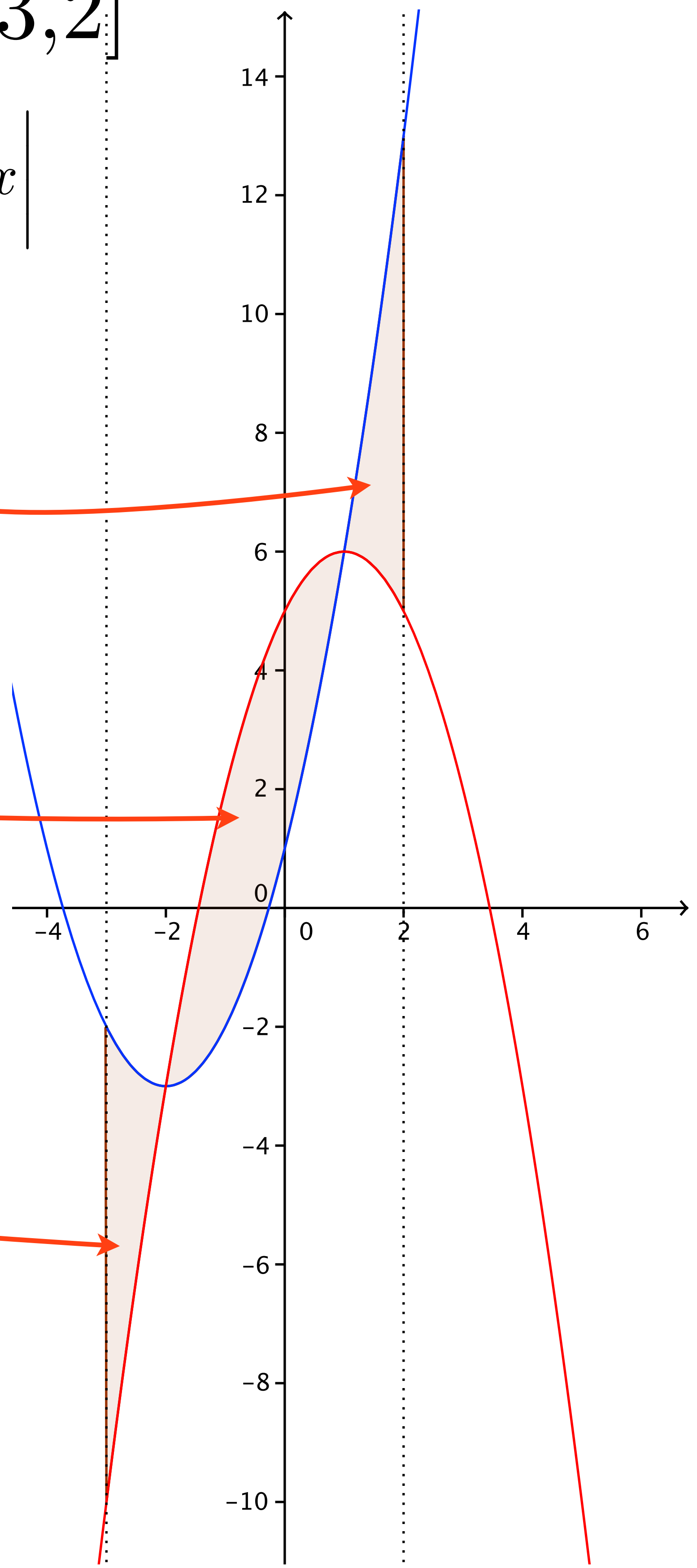


$$\text{Aire} = \left|\frac{11}{3}\right| + \left|-\frac{27}{3}\right| + \left|\frac{11}{3}\right| = \frac{49}{3}$$

Exemple

Calculer l'aire entre $f(x) = x^2 + 4x + 1$ et $g(x) = -x^2 + 2x + 5$ sur $[-3{,}2]$

$$\left|\int_{-3}^{-2} f(x) - g(x)\ dx\right| + \left|\int_{-2}^{1} f(x) - g(x)\ dx\right| + \left|\int_{1}^{2} f(x) - g(x)\ dx\right|$$



$$\text{Aire} = \left|\frac{11}{3}\right| + \left|-\frac{27}{3}\right| + \left|\frac{11}{3}\right| = \frac{49}{3}$$

Faites les exercices suivants

Section 1.6 # 37 c) à e)

Aujourd’hui, nous avons vu

Aujourd’hui, nous avons vu

- ✓ Changement de borne

Aujourd’hui, nous avons vu

✓ Changement de borne

✓ Fonction pair et fonction impair

Aujourd’hui, nous avons vu

✓ Changement de borne

✓ Fonction pair et fonction impair

✓ Calcul d’aire

Aujourd’hui, nous avons vu

- ✓ Changement de borne
- ✓ Fonction pair et fonction impair
- ✓ Calcul d’aire
- ✓ Calcul d’aire entre deux fonctions

Devoir: Section 1.6