



Derivadas e Integrais conceitos básicos



Derivadas e Integrais conceitos básicos

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

DERIVADA

$$f'(x) = ?$$



Derivadas e Integrais conceitos básicos

$$f(x) = x^2 \quad \text{DERIVADA} \quad f'(x) = ?$$
$$f'(x) = \lim_{\Delta x \rightarrow 0} \frac{f(x + \Delta x) - f(x)}{\Delta x}$$



Derivadas e Integrais conceitos básicos

$$\begin{aligned}f(x) &= x^2 && \text{DERIVADA} && f'(x) = ? \\f'(x) &= \lim_{\Delta x \rightarrow 0} \frac{f(x + \Delta x) - f(x)}{\Delta x} \\f(x + \Delta x) &= (x + \Delta x)^2 = x^2 + 2x\Delta x + (\Delta x)^2 \\f(x + \Delta x) - f(x) &= 2x\Delta x + (\Delta x)^2\end{aligned}$$



Derivadas e Integrais conceitos básicos

$$\begin{aligned}f(x) &= x^2 && \text{DERIVADA} && f'(x) = ? \\f'(x) &= \lim_{\Delta x \rightarrow 0} \frac{f(x+\Delta x) - f(x)}{\Delta x} \\f(x+\Delta x) &= (x+\Delta x)^2 = x^2 + 2x\Delta x + (\Delta x)^2 \\f(x+\Delta x) - f(x) &= 2x\Delta x + (\Delta x)^2 \\\frac{f(x+\Delta x) - f(x)}{\Delta x} &= 2x + \Delta x\end{aligned}$$



Derivadas e Integrais conceitos básicos

$$\begin{aligned}f(x) &= x^2 && \text{DERIVADA} && f'(x) = ? \\f'(x) &= \lim_{\Delta x \rightarrow 0} \frac{f(x+\Delta x) - f(x)}{\Delta x} \\f(x+\Delta x) &= (x+\Delta x)^2 = x^2 + 2x\Delta x + (\Delta x)^2 \\f(x+\Delta x) - f(x) &= 2x\Delta x + (\Delta x)^2 \\\frac{f(x+\Delta x) - f(x)}{\Delta x} &= 2x + \Delta x \\\lim_{\Delta x \rightarrow 0} (2x + \Delta x) &= 2x \\f'(x) &= 2x\end{aligned}$$



Derivadas e Integrais conceitos básicos

$$f(x) = x^3$$



Derivadas e Integrais conceitos básicos

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$$\begin{aligned} f(x + \Delta x) &= (x + \Delta x)(x + \Delta x)(x + \Delta x) \\ &= x^3 + 3x^2\Delta x + 3x(\Delta x)^2 + (\Delta x)^3 \end{aligned}$$



Derivadas e Integrais conceitos básicos

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$$\begin{aligned} \frac{f(x+\Delta x) - f(x)}{\Delta x} &= \frac{3x^2\Delta x + 3x(\Delta x)^2 + (\Delta x)^3}{\Delta x} \\ &= 3x^2 + 3x(\Delta x) + (\Delta x)^2 \end{aligned}$$



Derivadas e Integrais conceitos básicos

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$$\frac{f(x+\Delta x) - f(x)}{\Delta x} = \frac{3x^2\Delta x + 3x(\Delta x)^2 + (\Delta x)^3}{\Delta x}$$

$$= 3x^2 + 3x(\Delta x) + (\Delta x)^2$$

$$\lim_{\Delta x \rightarrow 0} [3x^2 + 3x(\Delta x) + (\Delta x)^2] = 3x^2$$



Derivadas e Integrais conceitos básicos

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$$\lim_{\Delta x \rightarrow 0} [3x^2 + 3x(\Delta x) + (\Delta x)^2] = 3x^2$$

$$\boxed{f'(x) = 3x^2}$$



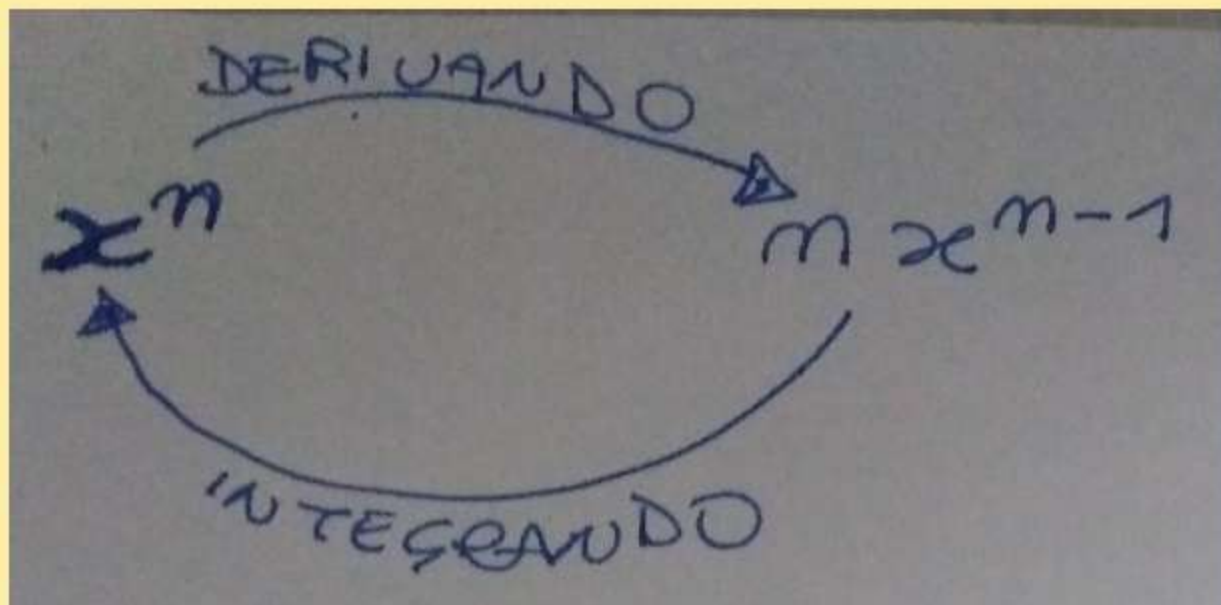
Derivadas e Integrais conceitos básicos

DERIVANDO

$$x^n \rightarrow n x^{n-1}$$



Derivadas e Integrais conceitos básicos





Derivadas e Integrais conceitos básicos

1) Quando usaremos as derivadas?

2) Quando usaremos as integrais?



Derivadas e Integrais conceitos básicos

1) Quando usaremos as derivadas?

Determinar máximos, mínimos,
ângulos das retas tangentes

2) Quando usaremos as integrais?



Derivadas e Integrais conceitos básicos

1) Quando usaremos as derivadas?

Determinar máximos, mínimos,
ângulos das retas tangentes

2) Quando usaremos as integrais?

Calcular áreas

$$f(x) = x^2 + 4x$$



Derivada de x^n : $n x^{n-1}$

Integral de x^n : $\frac{x^{n+1}}{n+1}$

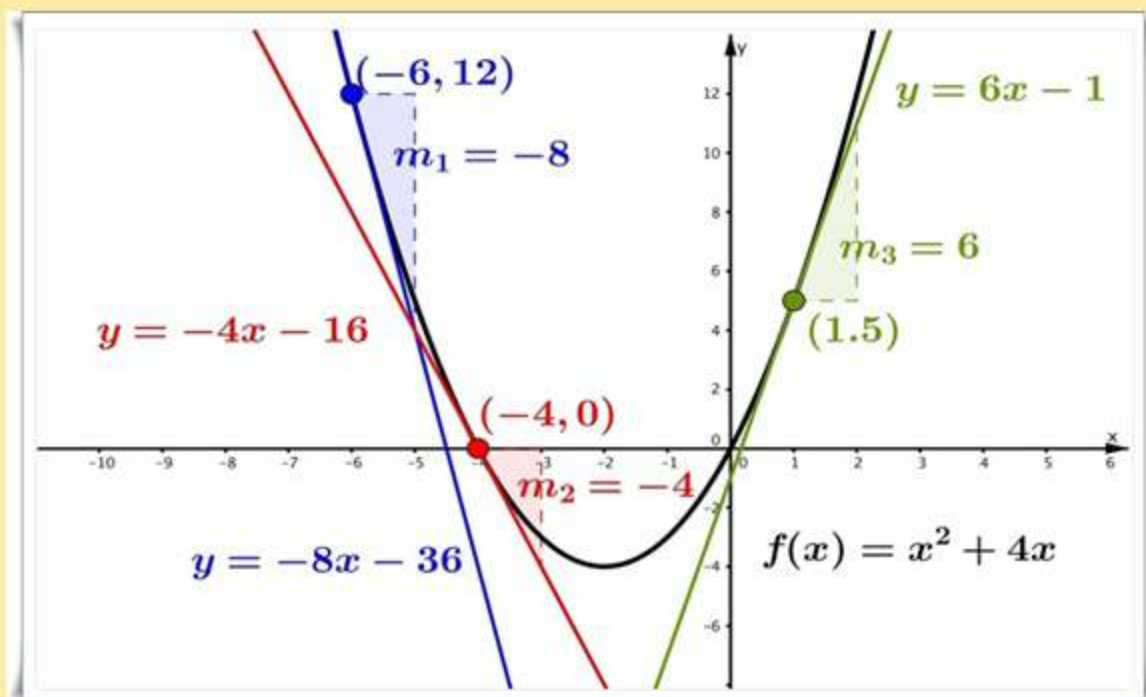


$$f(x) = x^2 + 4x$$

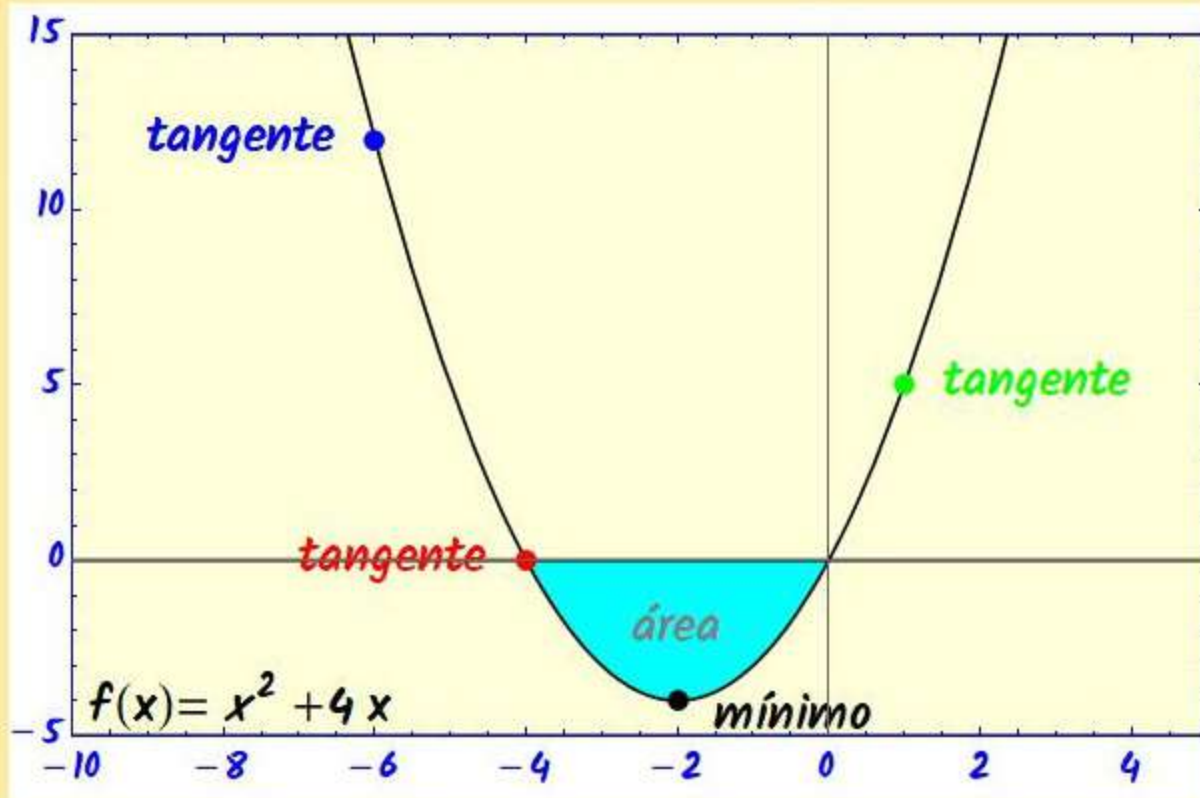


Derivada de x^n : $n x^{n-1}$

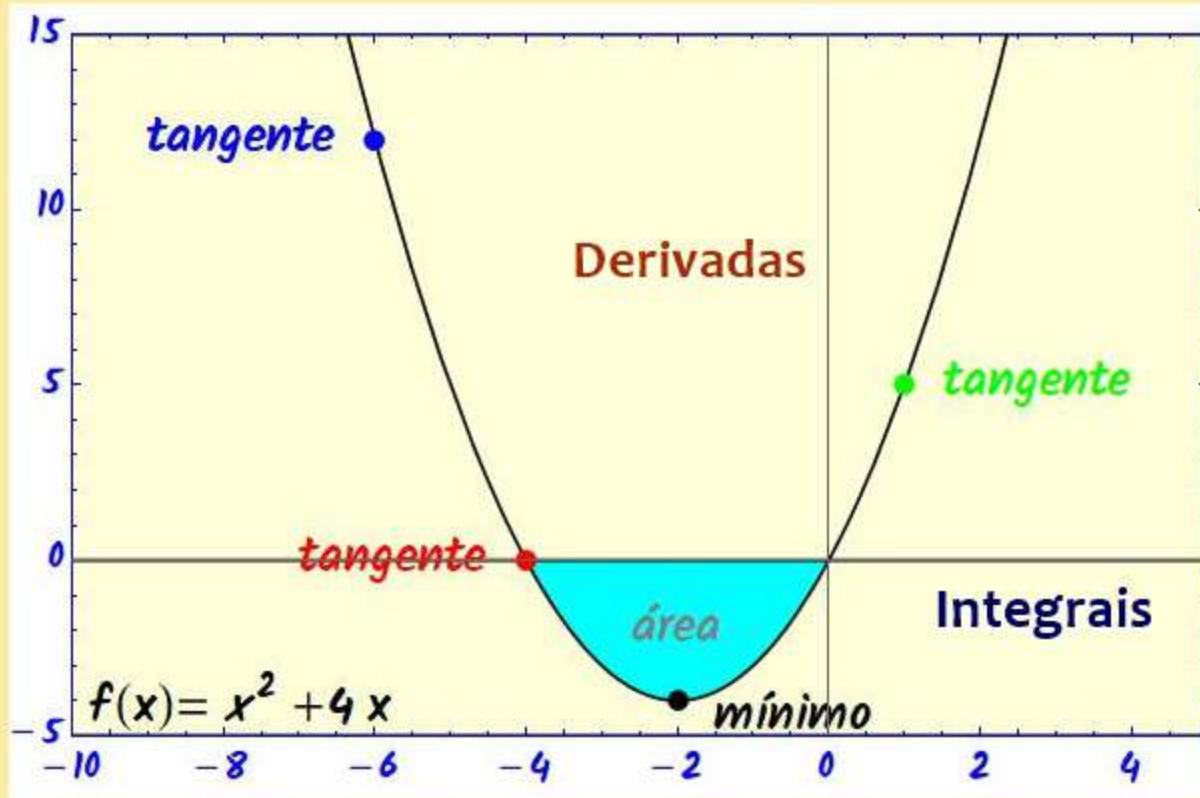
Integral de x^n : $\frac{x^{n+1}}{n+1}$



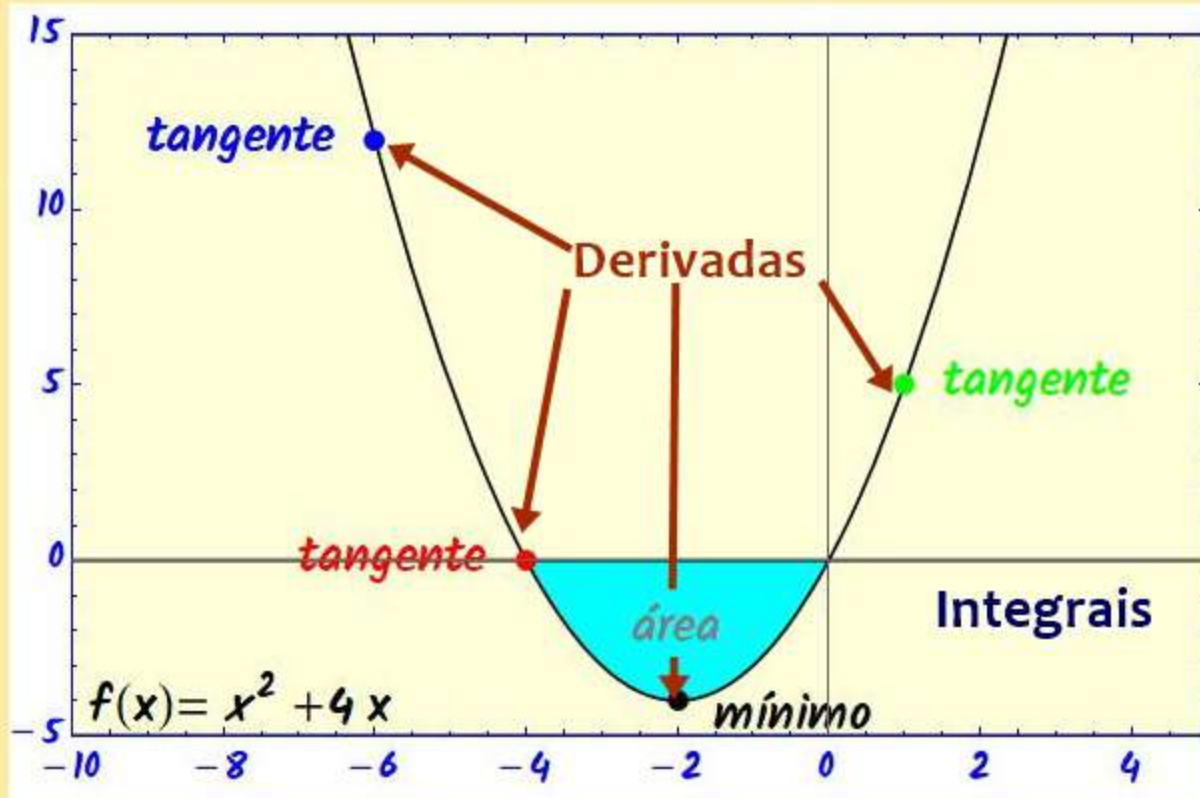
$$f(x) = x^2 + 4x$$



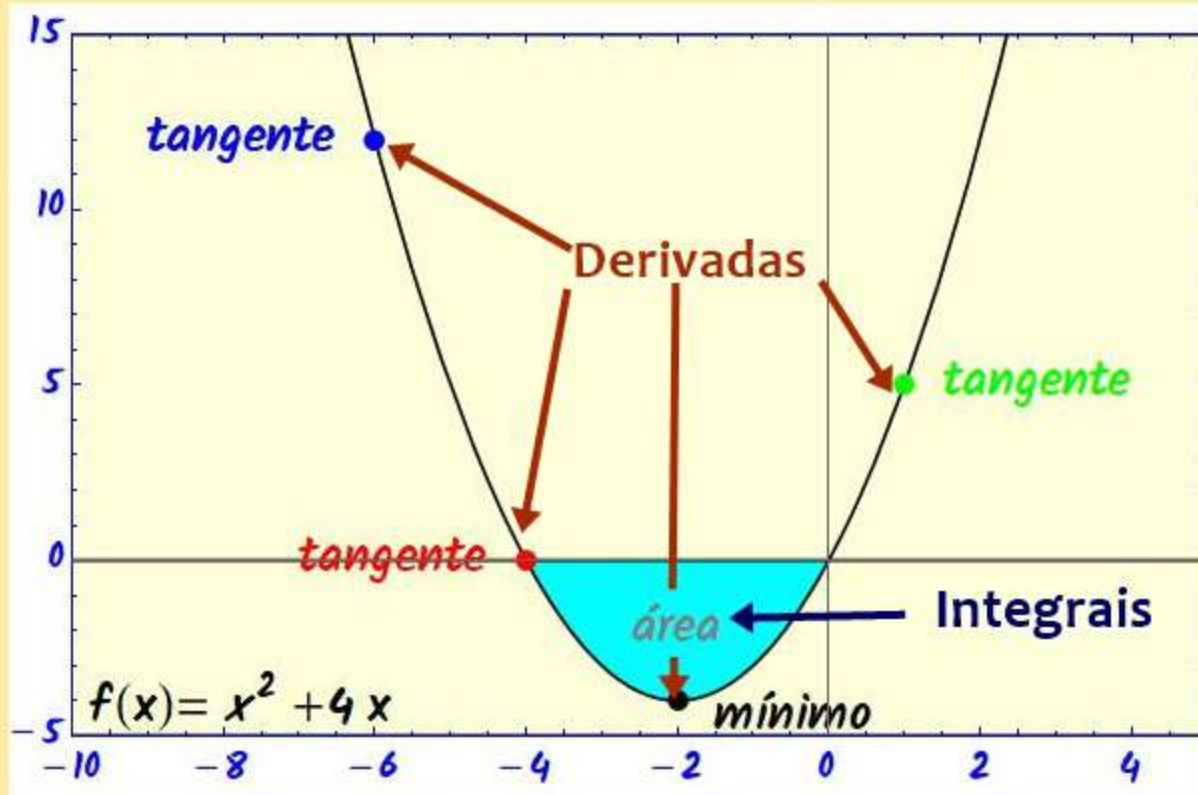
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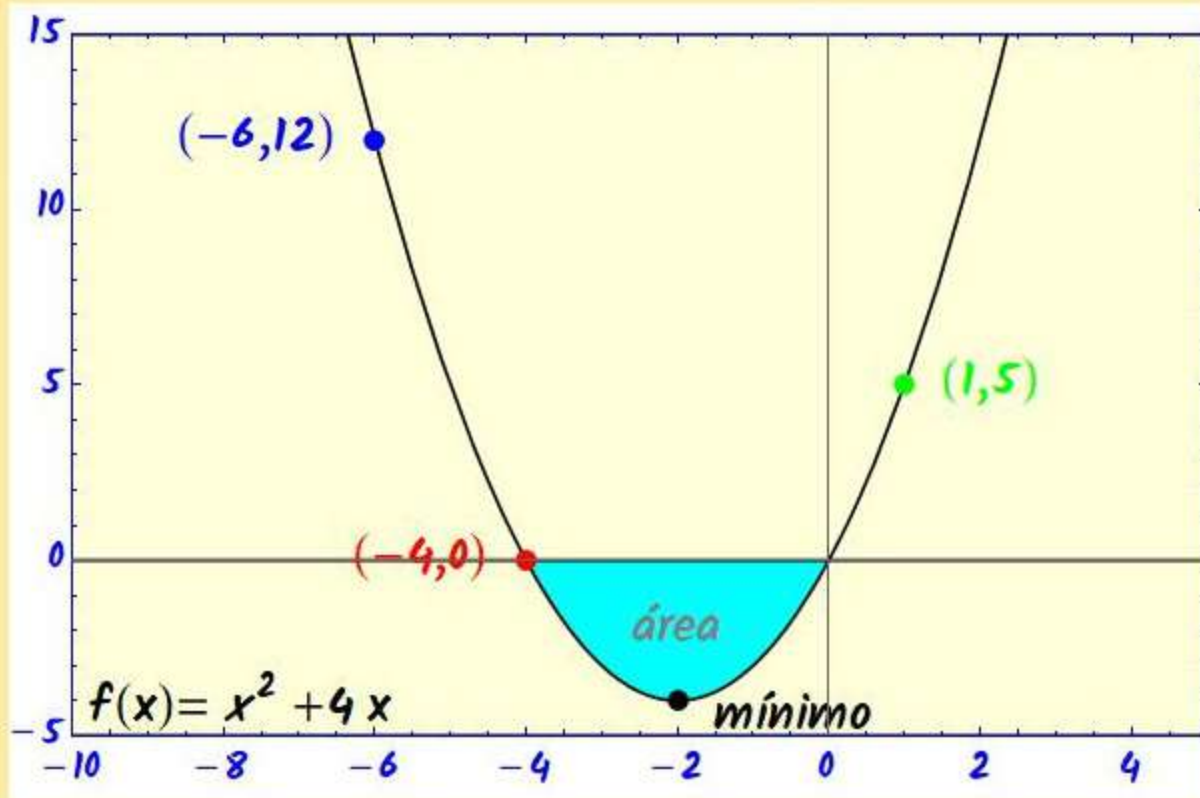
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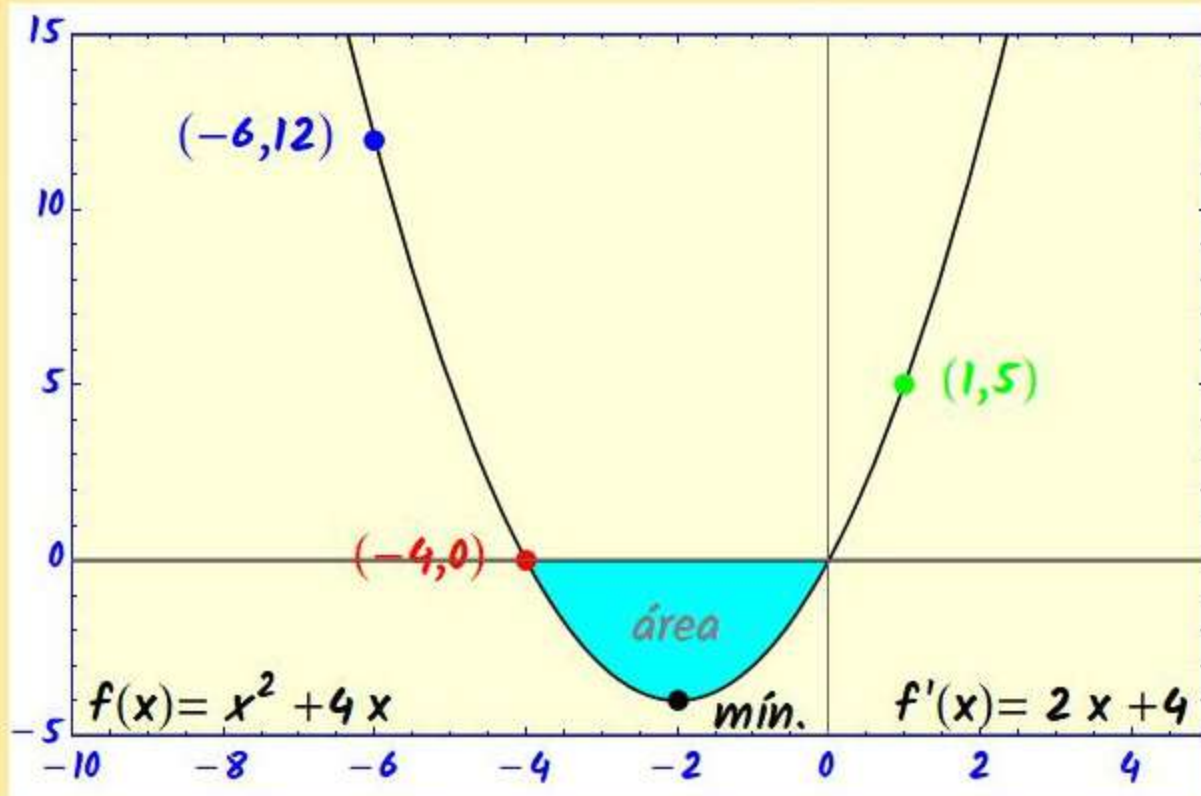
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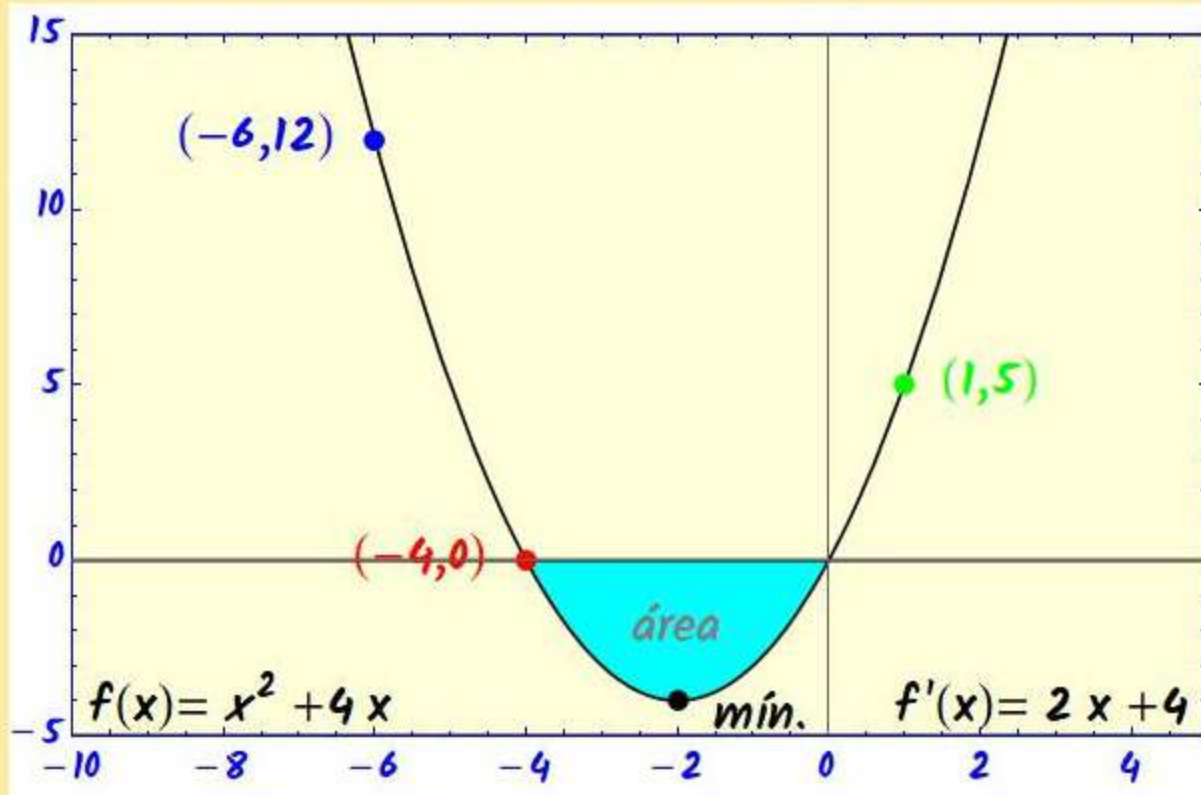
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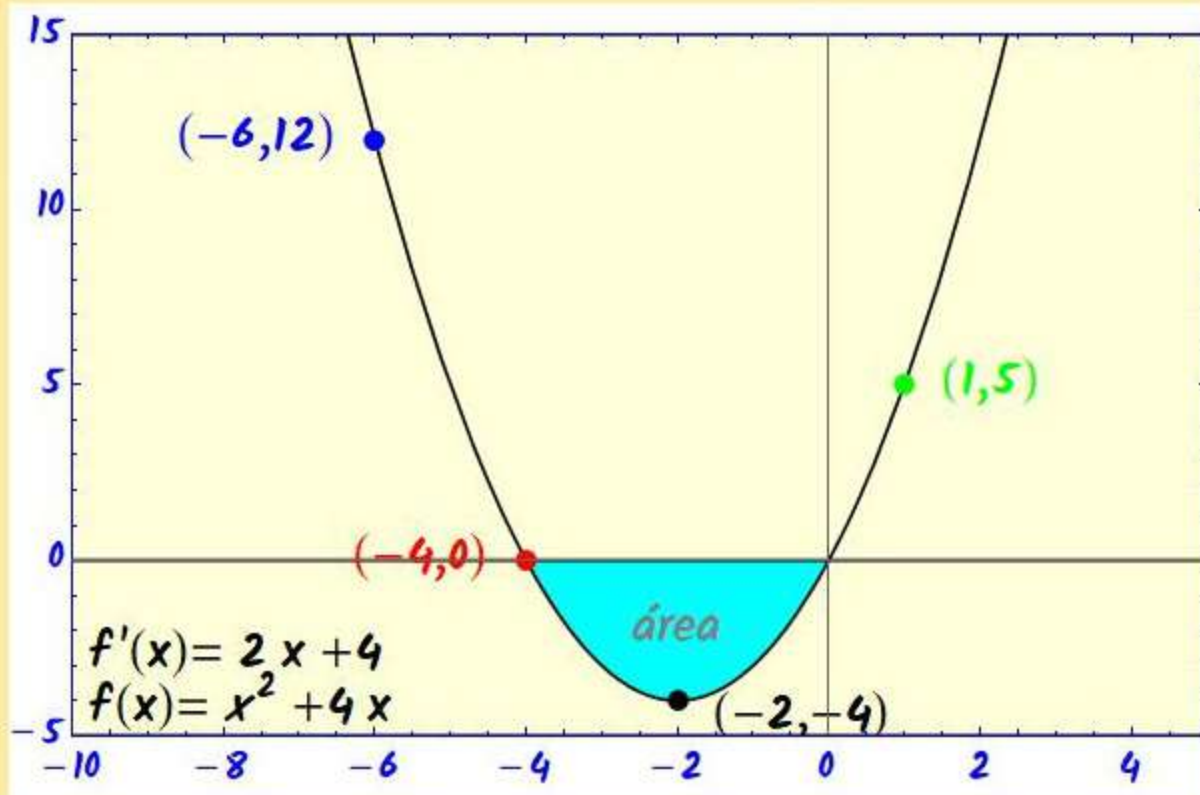
$$f(x) = x^2 + 4x$$



$f'(x) = 0$ implica $x = -2$ então $x_{\min} = -2$



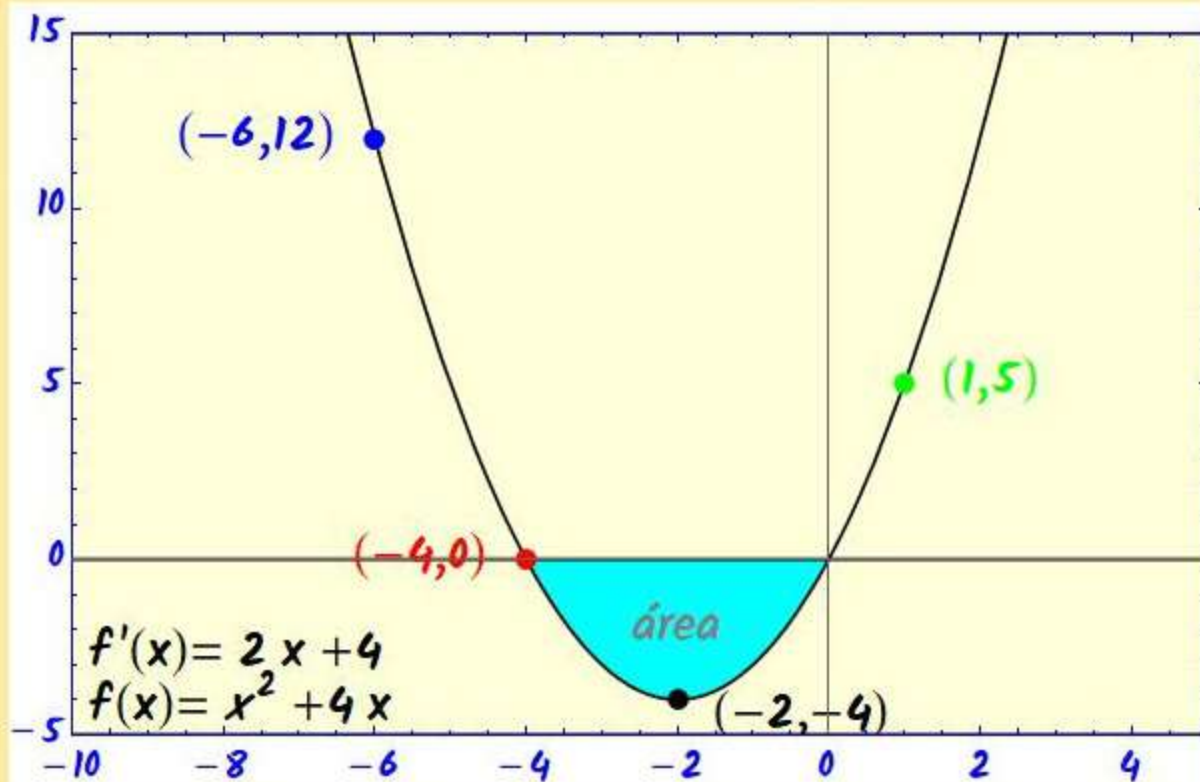
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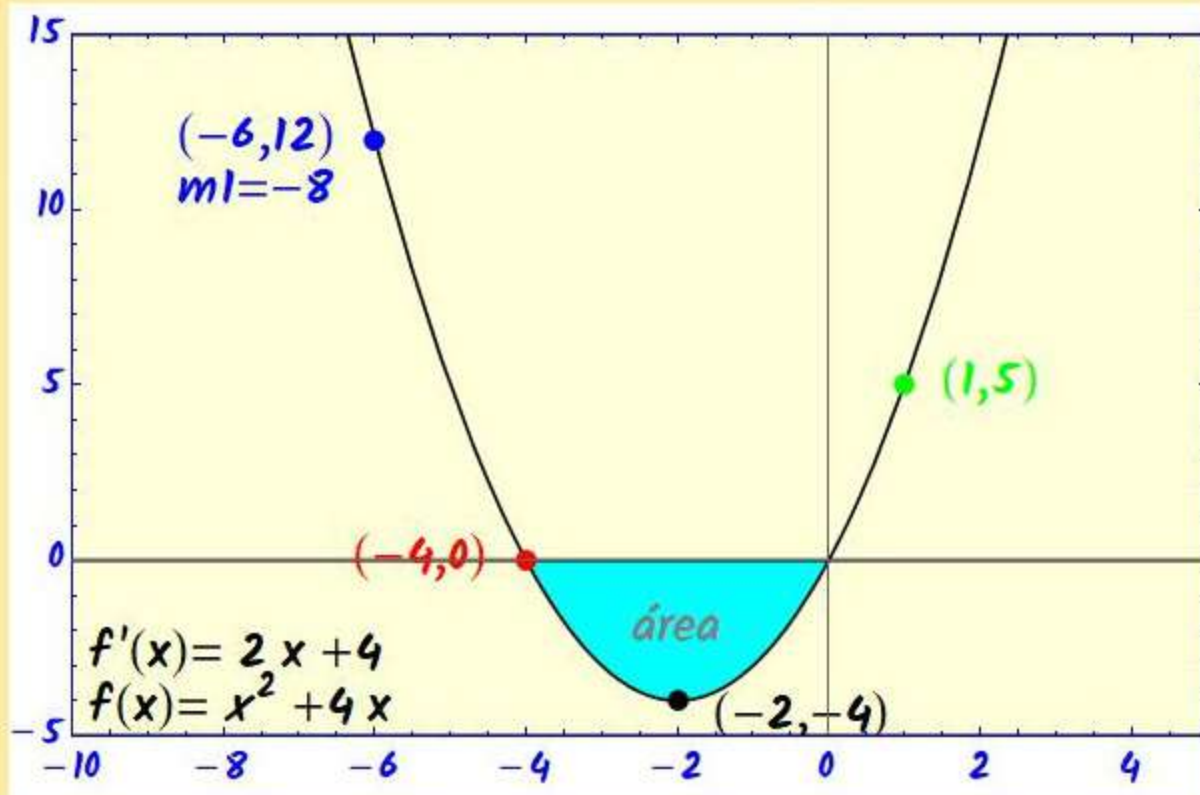
$$f(x) = x^2 + 4x$$



$$f'(-6) = -12 + 4 = -8 \text{ implica } m_l = -8$$



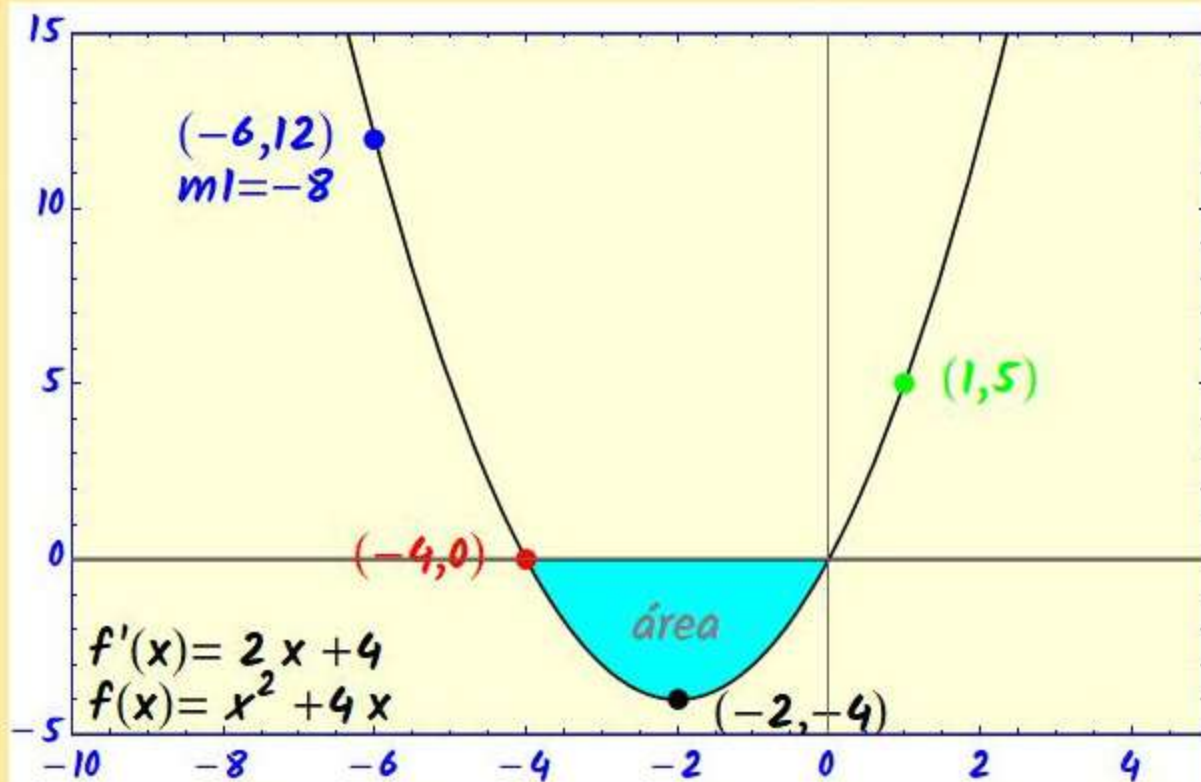
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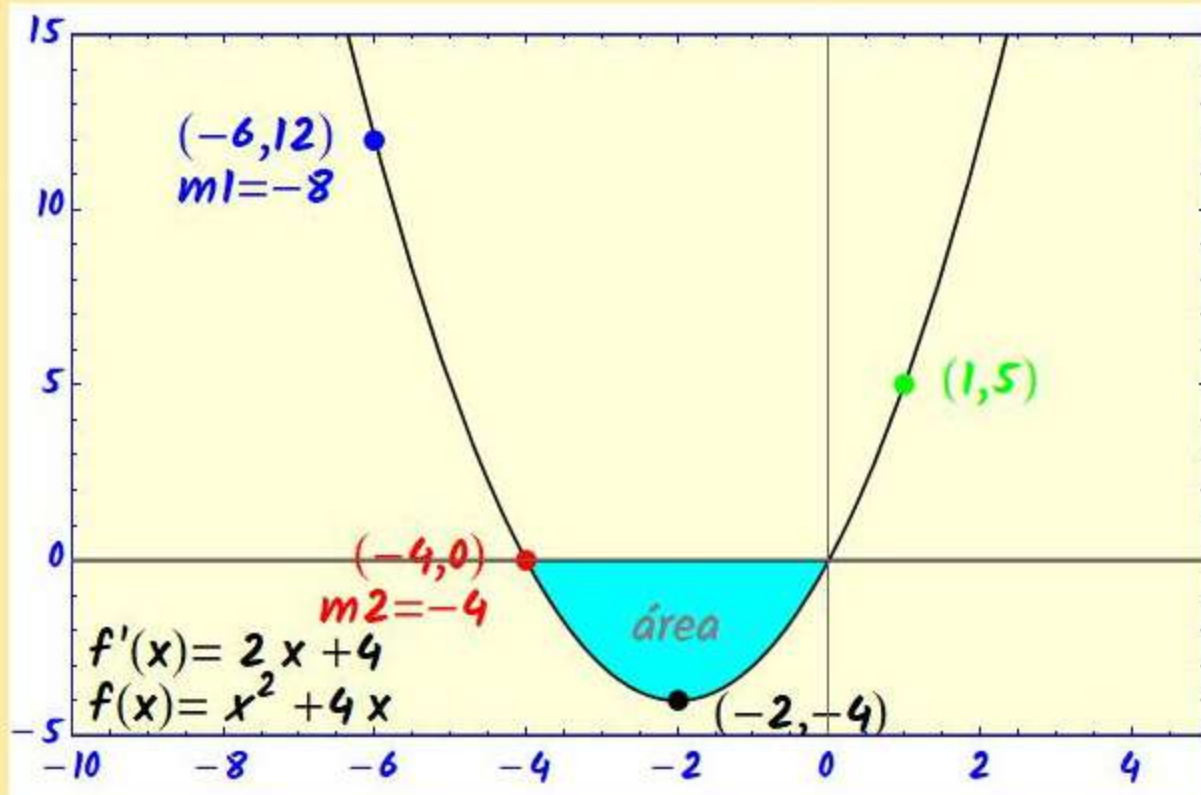
$$f'(-4) = -8 + 4 = -4 \text{ implica } m_2 = -4$$



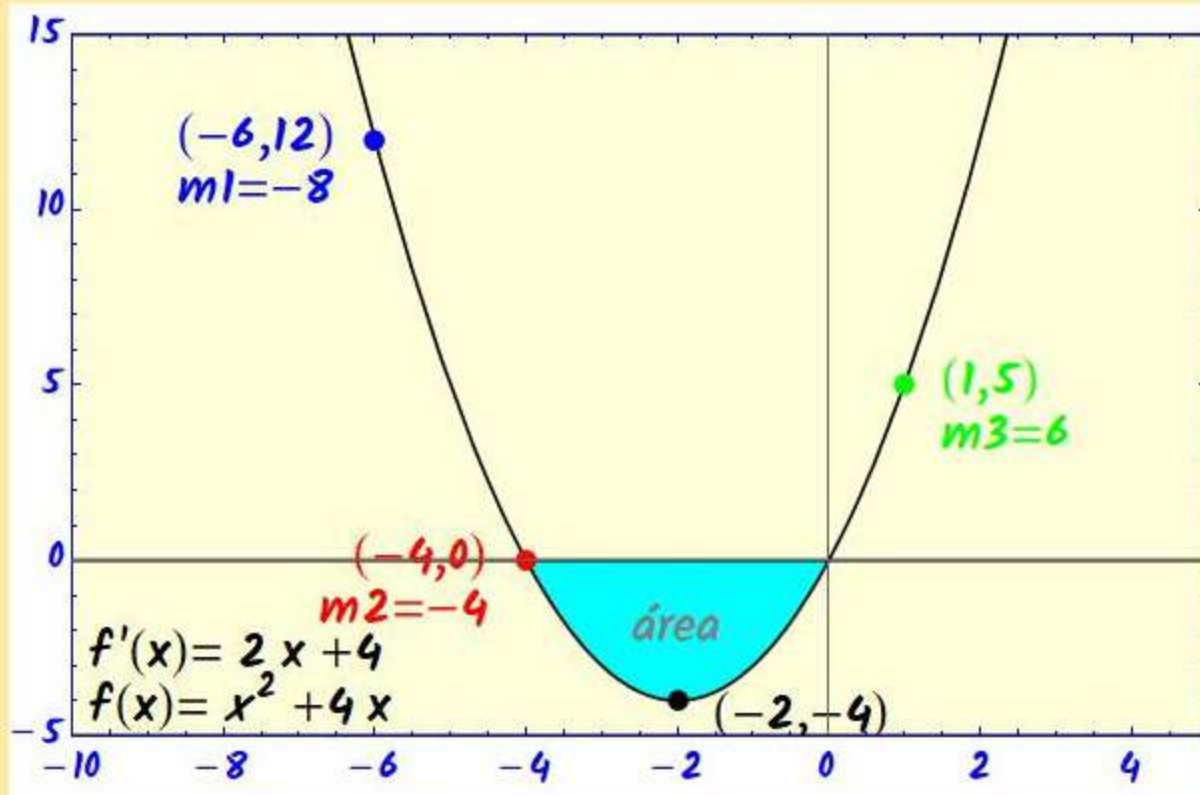
$$f(x) = x^2 + 4x$$



$$f'(1) = 2 + 4 = 6 \text{ implica } m_3 = 6$$



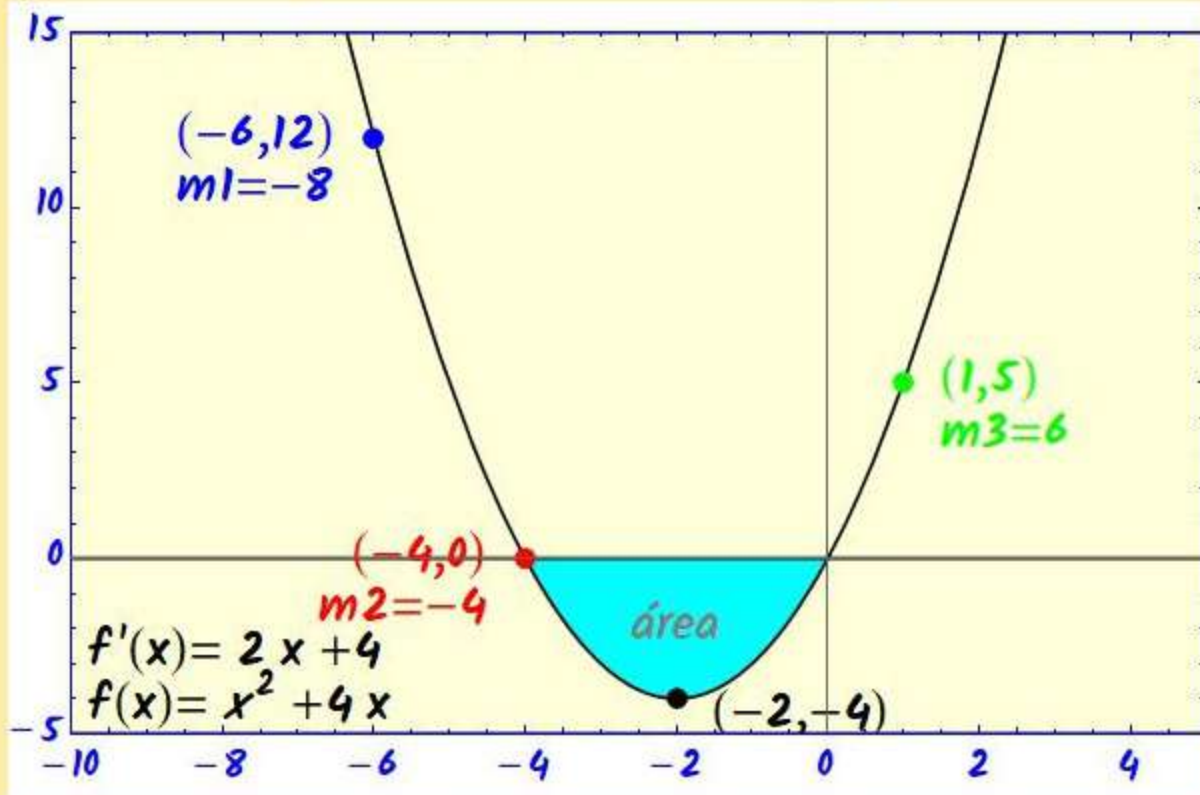
$$f(x) = x^2 + 4x$$



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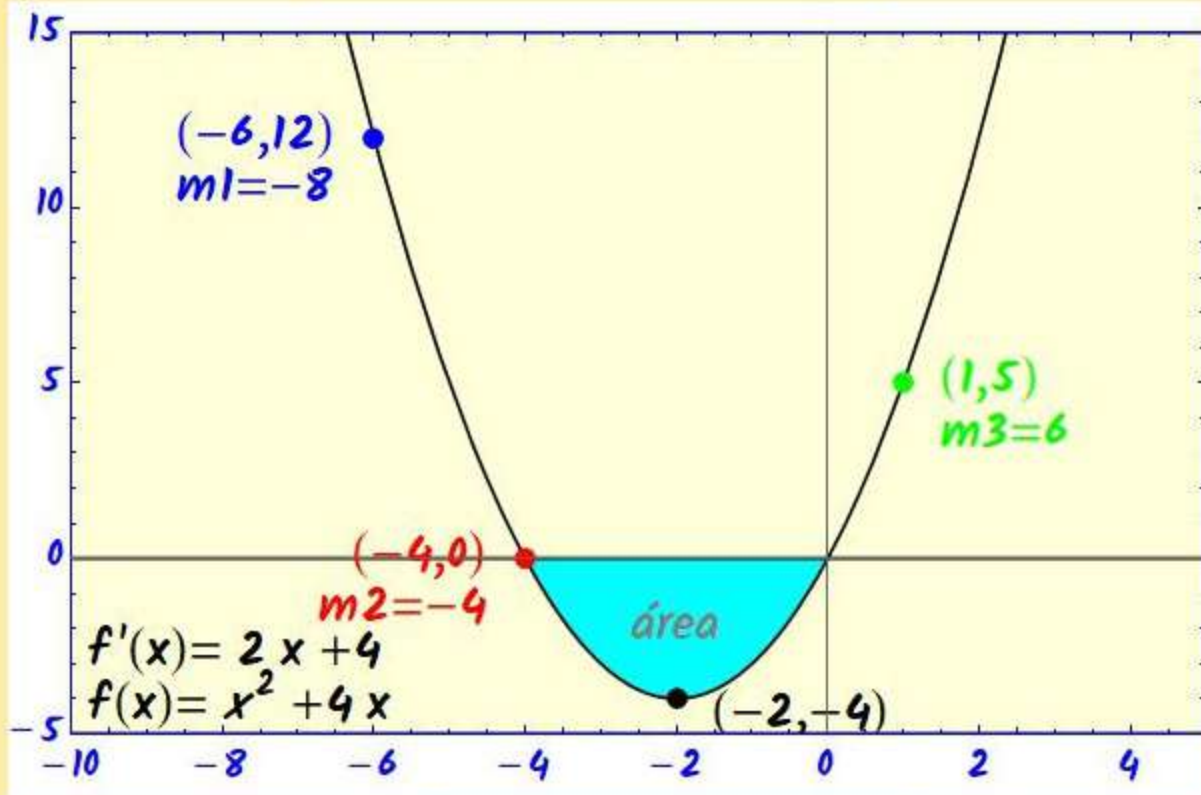
$$i(x) = \frac{x^3}{3} + 4 \frac{x^2}{2} = \frac{x^3}{3} + 2x^2$$



$$f(x) = x^2 + 4x$$



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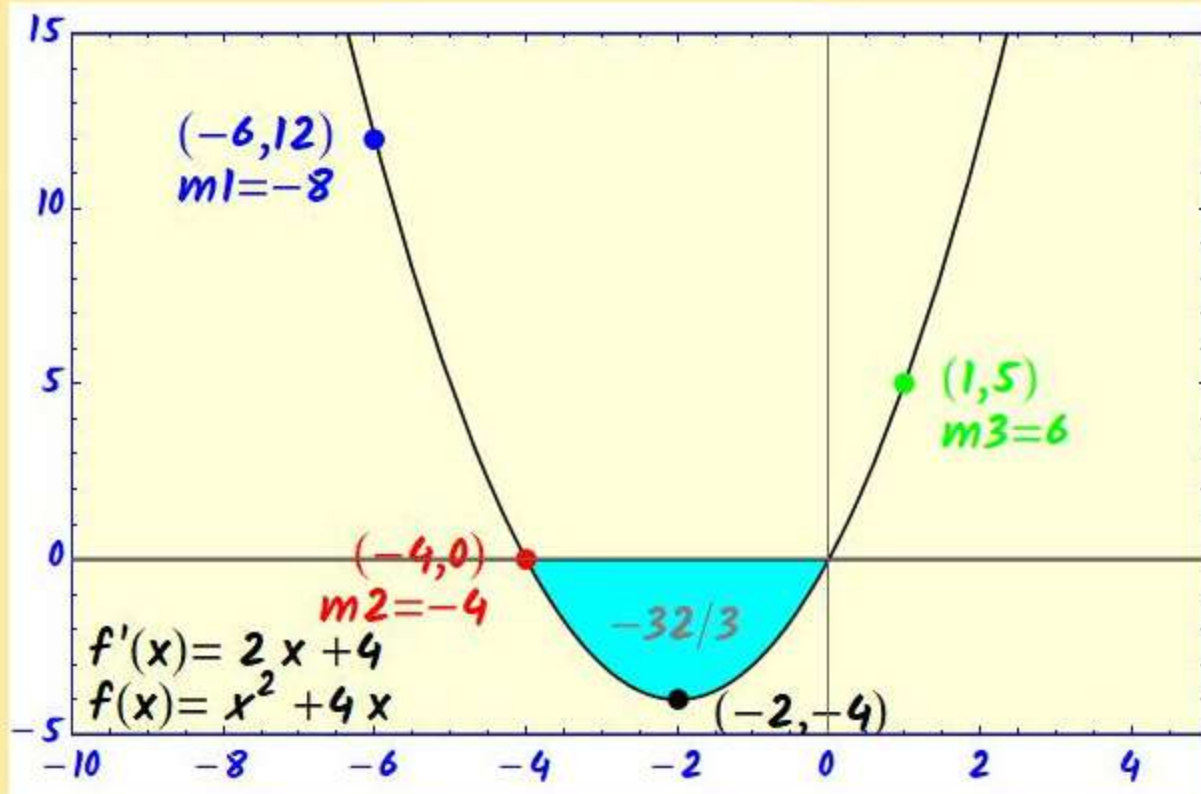


$$i(0) - i(-4) = -\frac{32}{3}$$

$$f(x) = x^2 + 4x$$



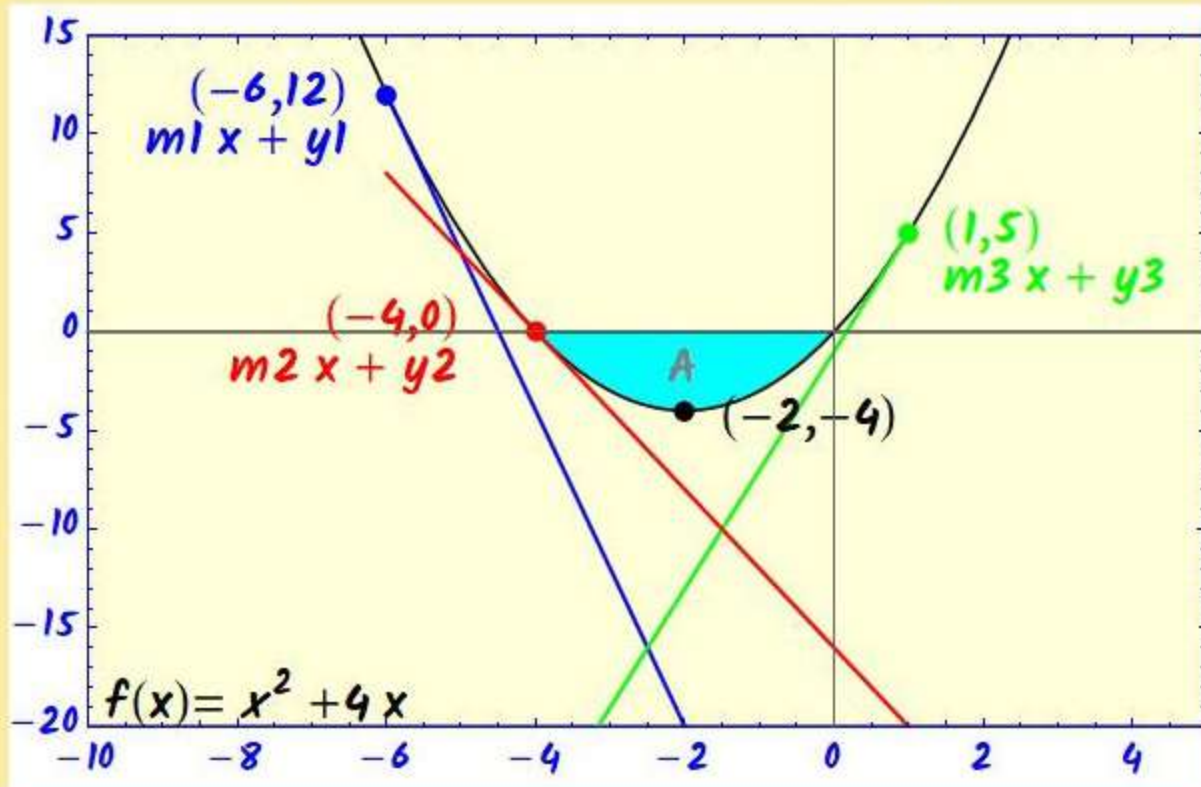
$$i(x) = \frac{x^3}{3} + 2x^2$$



$$f'(x) = 2x + 4$$

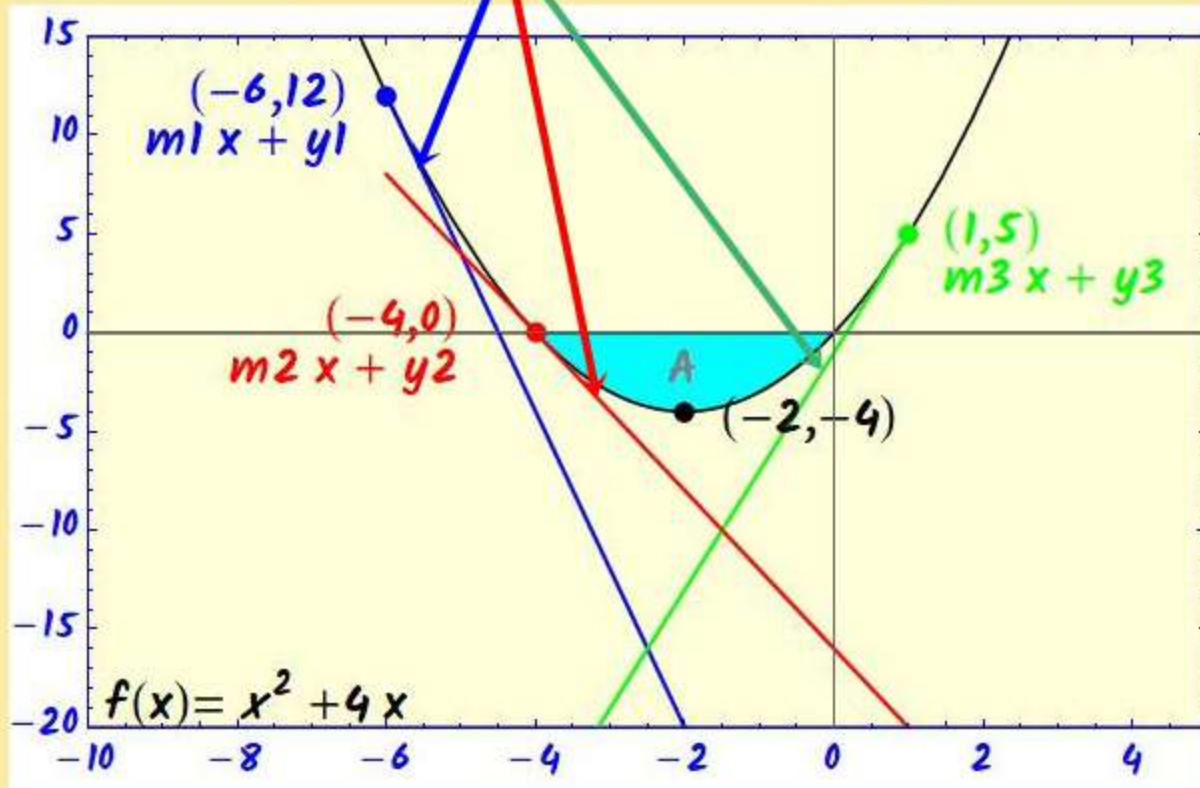


$$f'(x) = 2x + 4 \quad \& \quad i(x) = \frac{x^3}{3} + 2x^2$$



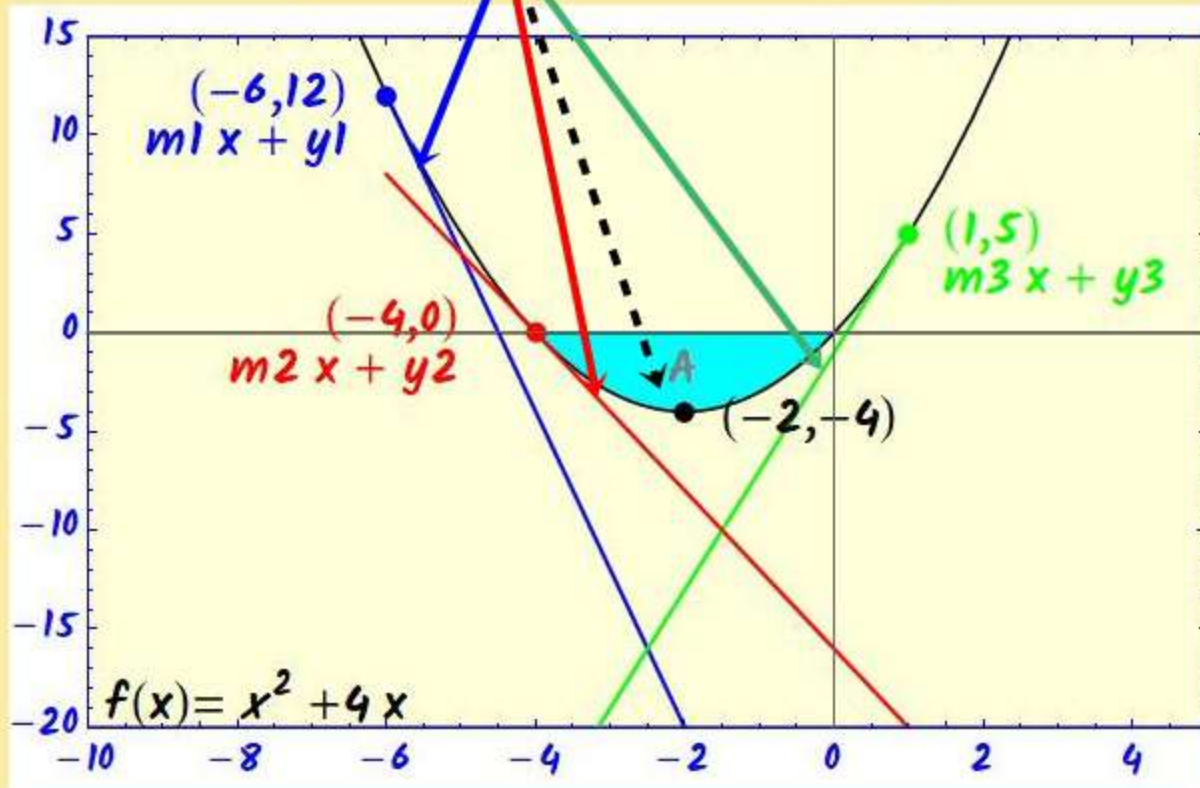


$$f'(x) = 2x + 4 \quad \& \quad i(x) = \frac{x^3}{3} + 2x^2$$



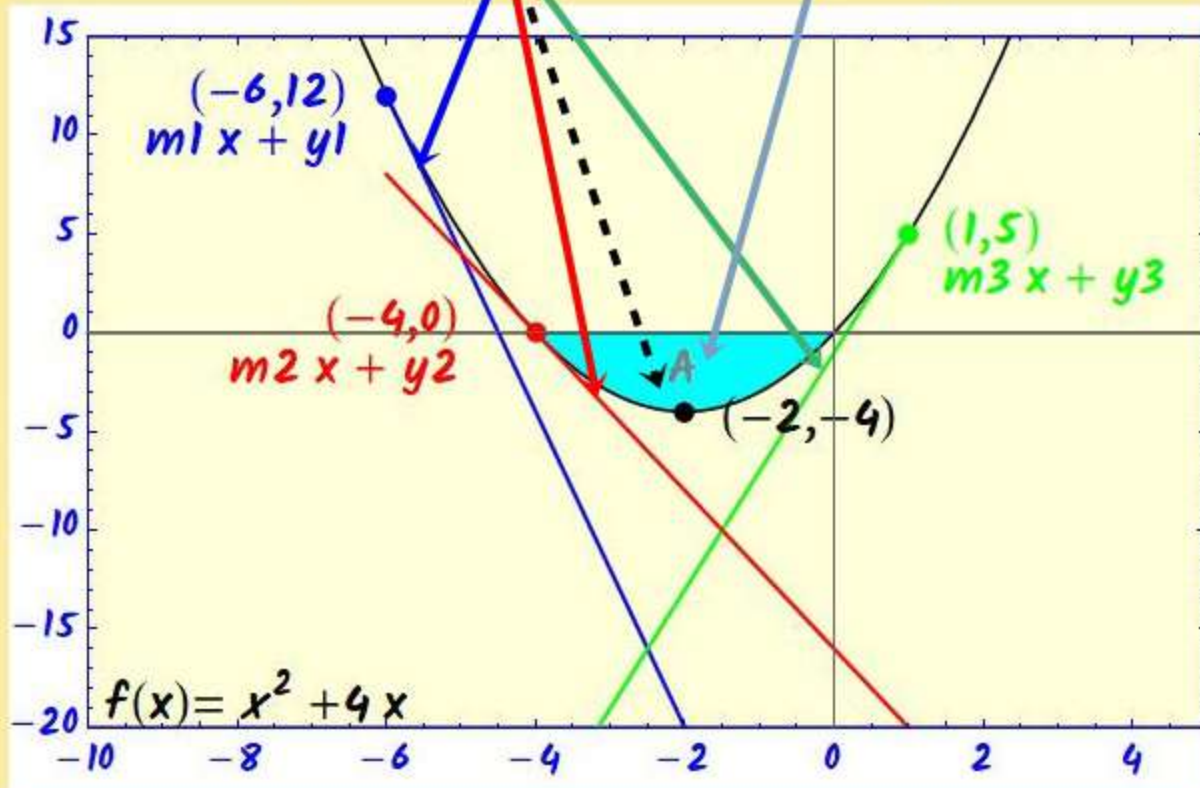


$$f'(x) = 2x + 4 \quad \& \quad i(x) = \frac{x^3}{3} + 2x^2$$



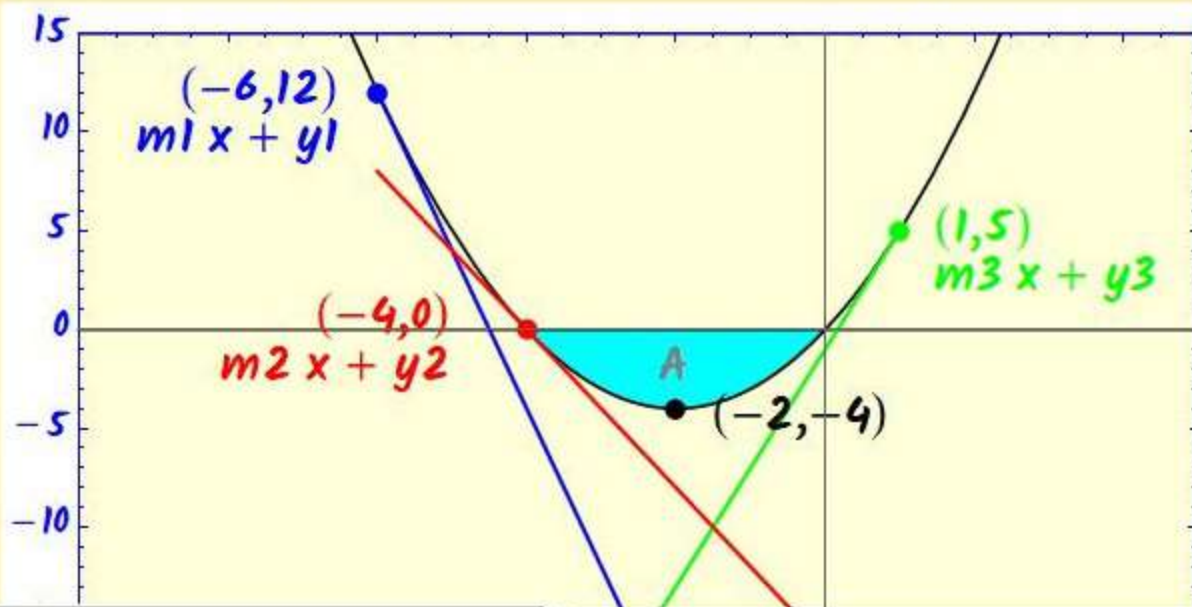


$$f'(x) = 2x + 4 \quad \& \quad i(x) = \frac{x^3}{3} + 2x^2$$





$$f'(x) = 2x + 4 \quad \& \quad i(x) = \frac{x^3}{3} + 2x^2$$



$$f'(-6) = m1 \quad [m1 = -8]$$

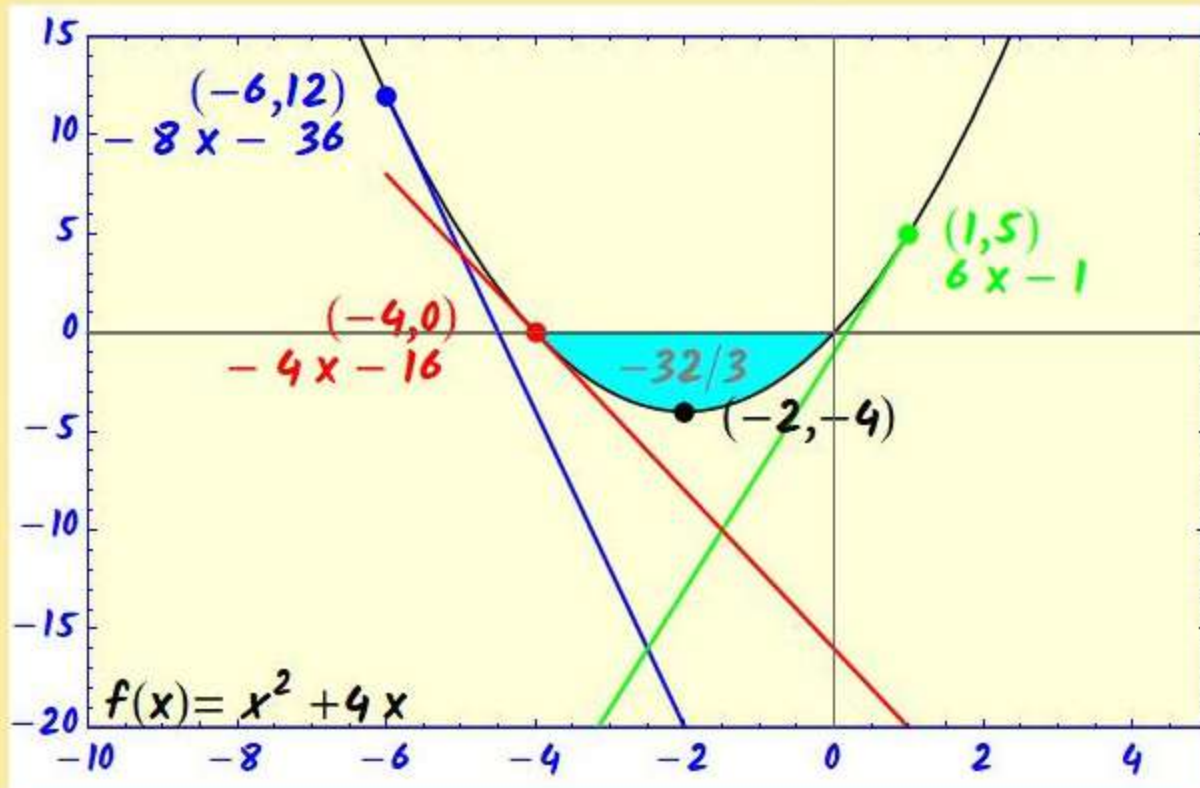
$$f'(-4) = m2 \quad [m2 = -4]$$

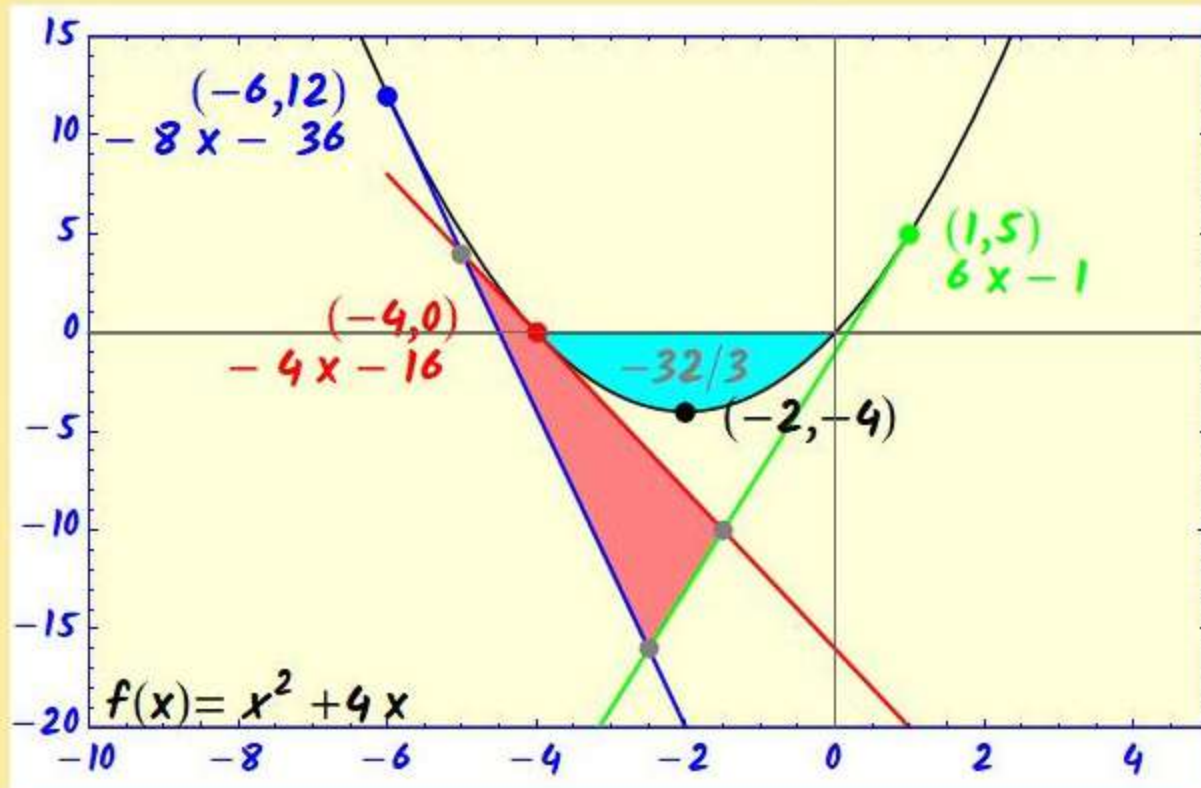
$$f'(1) = m3 \quad [m3 = 6]$$

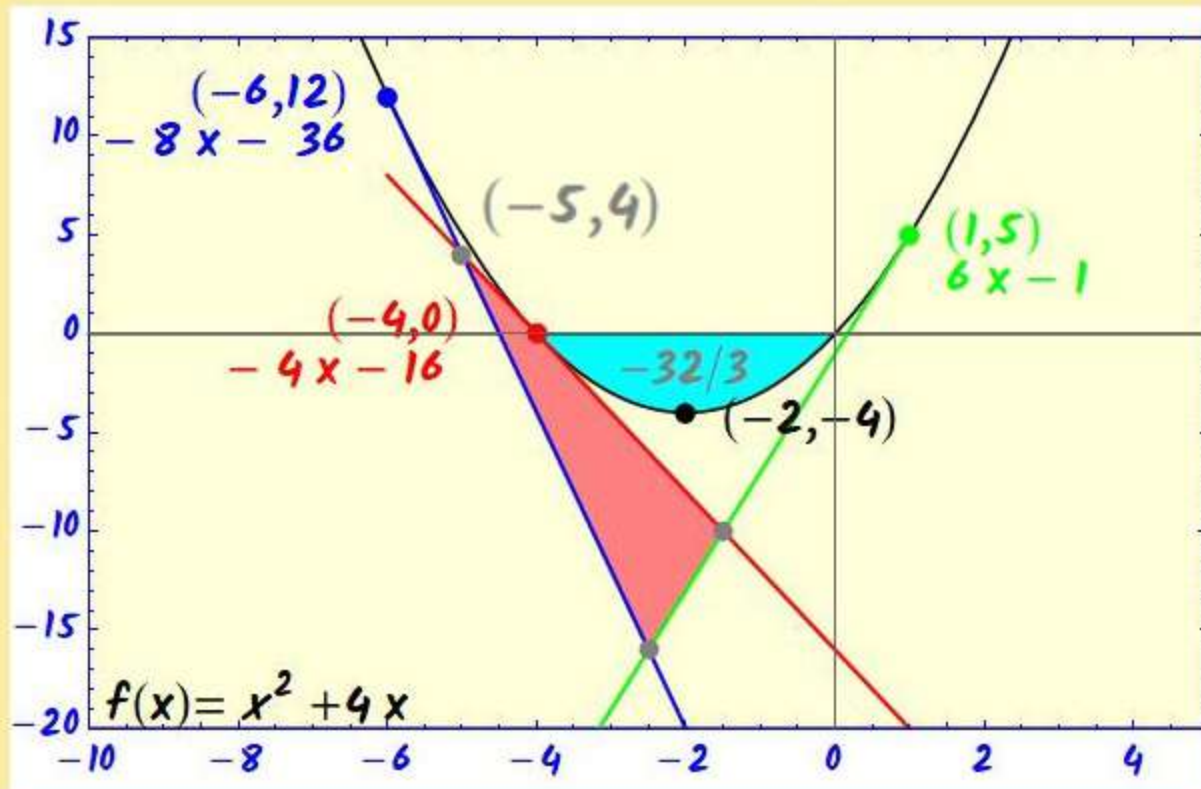
$$12 = -8(-6) + y1 \quad [y1 = -36]$$

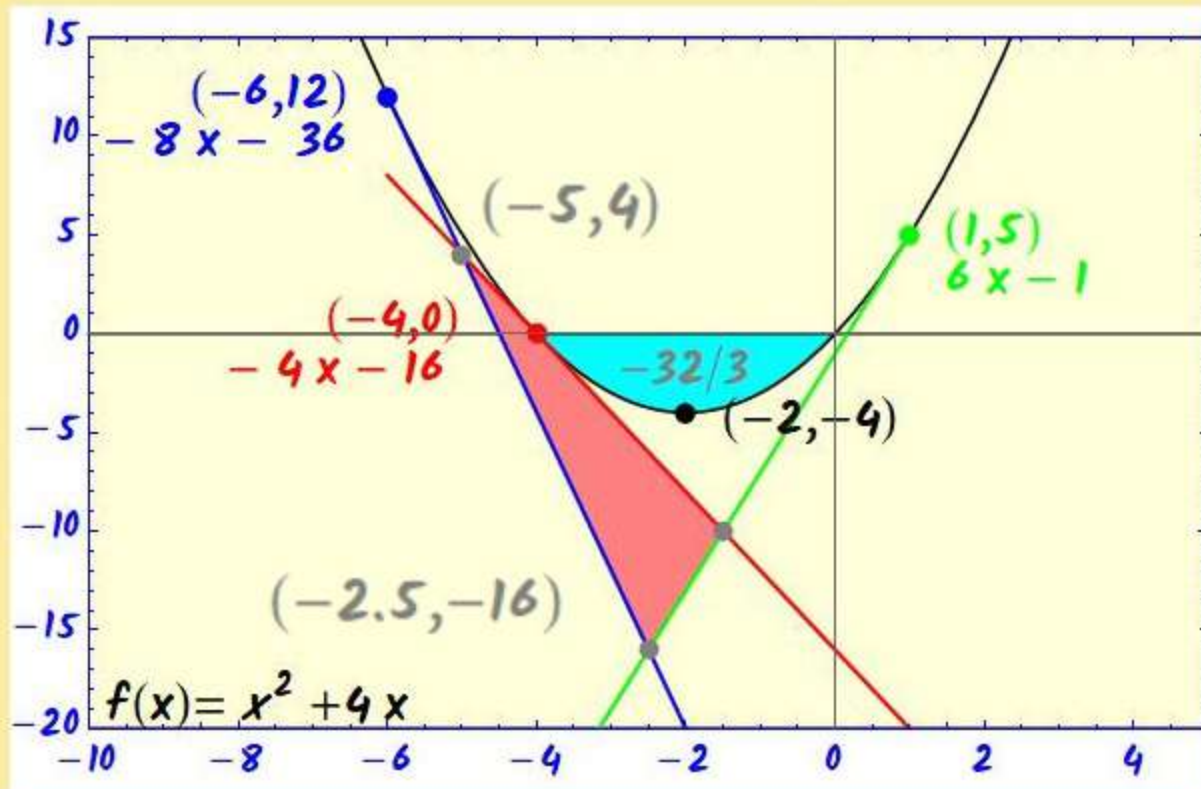
$$0 = -4(-4) + y2 \quad [y2 = -16]$$

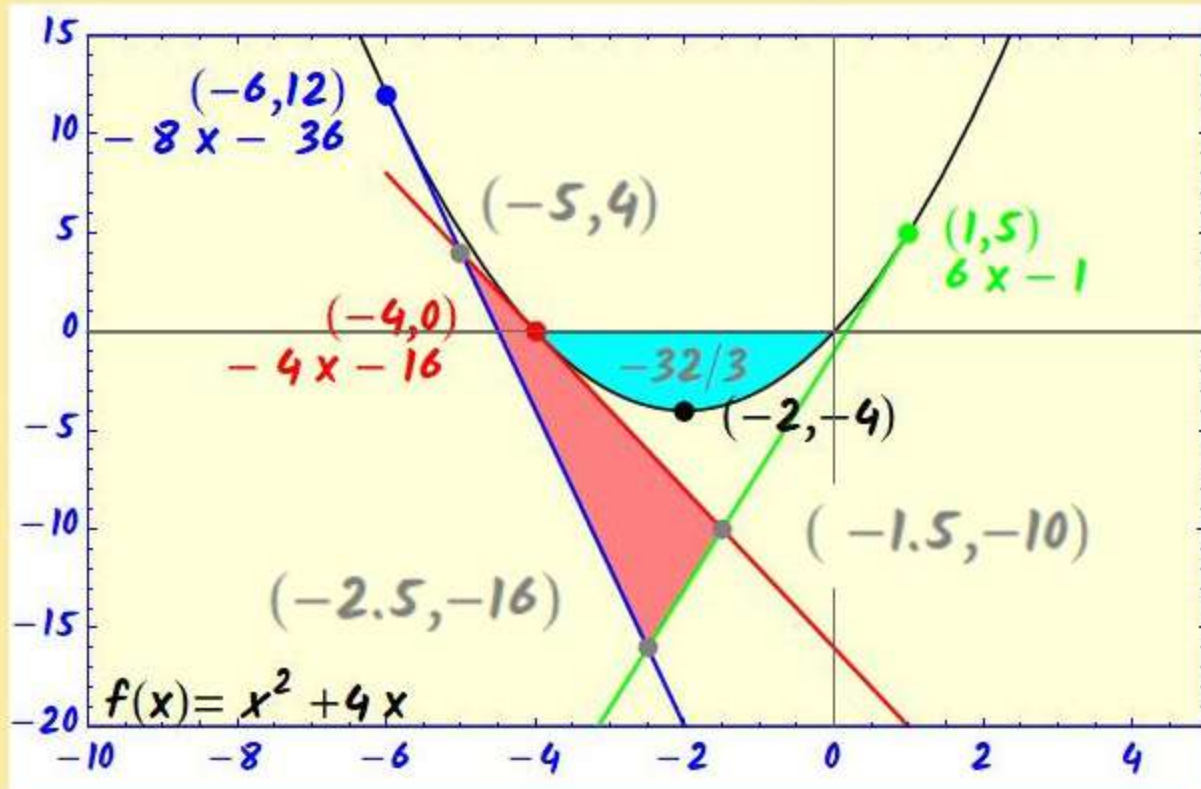
$$5 = 6(1) + y1 \quad [y3 = -1]$$

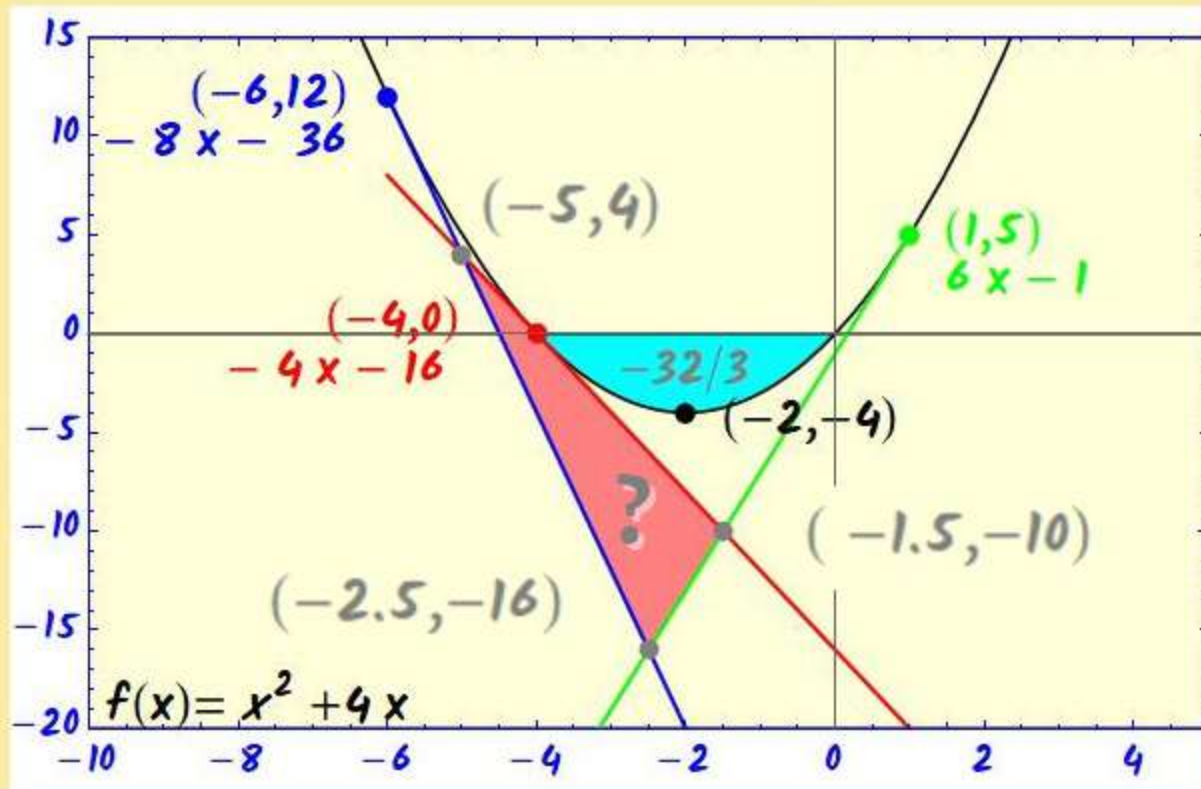












Integração e derivação funções cúbicas



Integração e derivação funções cúbicas

Retas entre dois pontos

Reta tangente a $f(x)$

Fórmulas

Integração e derivação funções cúbicas

Retas entre dois pontos

$$A = \{ x_A, y_A \}$$

$$B = \{ x_B, y_B \}$$

$$r_{AB}(x) = m_{AB} x + d_{AB}$$

Reta tangente a $f(x)$

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$$y_A = m_{AB} x_A + d_{AB} \quad (1)$$

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$$(1) - (2)$$

Reta tangente a $f(x)$

Fórmulas

$$y_A - y_B = m_{AB} (x_A - x_B)$$

$$\Downarrow$$

$$m_{AB} = \frac{y_A - y_B}{x_A - x_B} \quad (3)$$

Integração e derivação funções cúbicas

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Fórmulas

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substituindo m_{AB} em (1)

$$\begin{aligned} y_A &= \frac{y_A - y_B}{x_A - x_B} (x_A - x_B) \\ \Downarrow \\ d_{AB} &= \frac{x_A y_B - x_B y_A}{x_A - x_B} \end{aligned} \quad (4)$$

Integração e derivação funções cúbicas

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Reta tangente a $f(x)$

$$A = \{x_A, y_A\}$$

$$\tan_A(x) = f'(x_A) x + d_A$$

Fórmulas

Integração e derivação funções cúbicas

Retas entre dois pontos

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$$B = \{x_B, y_B\}$$

$$r_{AB}(x) = m_{AB} x + d_{AB}$$

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Reta tangente a $f(x)$

$$A = \{x_A, y_A\}$$

$$\tan_A(x) = f'(x_A) x + d_A$$

$$y_A = f'(x_A) x_A + d_A$$

$$\Downarrow$$

$$d_A = y_A - f'(x_A) x_A$$

Fórmulas

Integração e derivação funções cúbicas

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Reta tangente a $f(x)$

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$$\tan_A(x) = f'(x_A) x + d_A$$

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$$\Downarrow$$

$$d_A = y_A - f'(x_A) x_A$$

$$\tan_A(x) = f'(x_A) (x - x_A) + y_A \quad (5)$$

Fórmulas

Integração e derivação funções cúbicas

Retas entre dois pontos

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Fórmulas

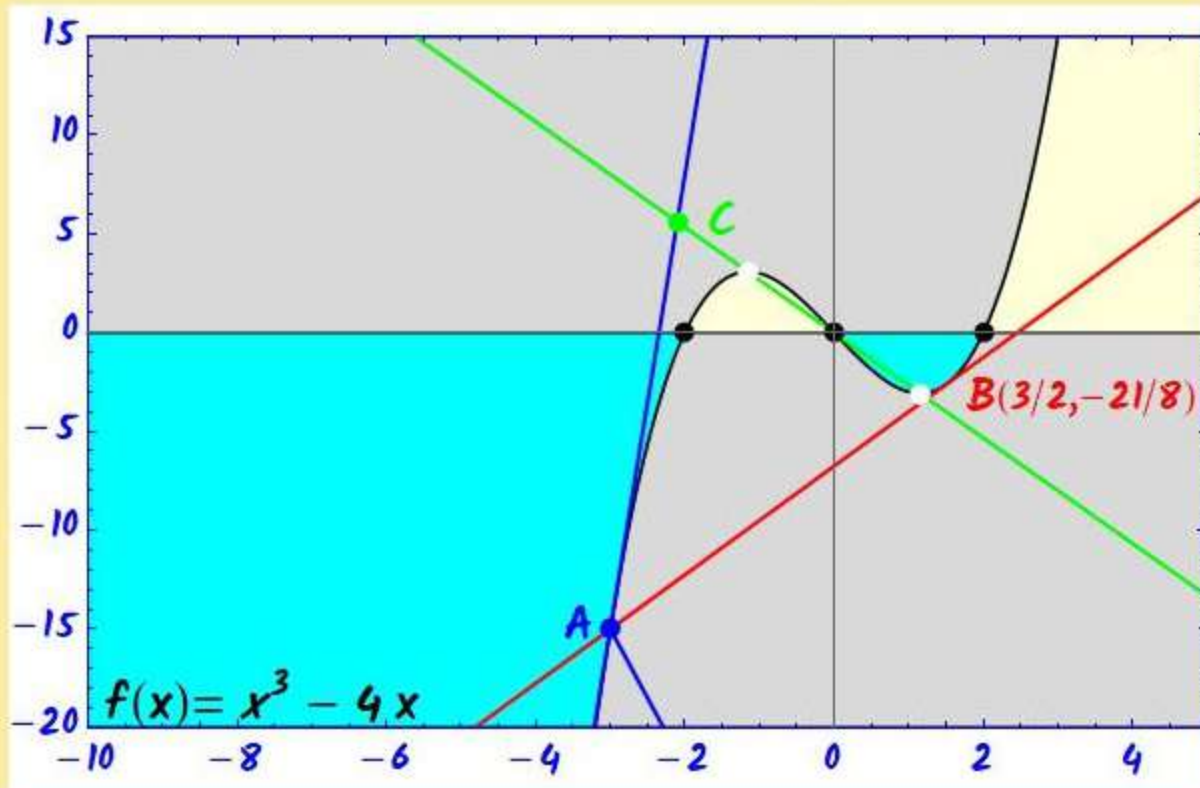
$$r_{AB}(x) = \frac{y_A - y_B}{x_A - x_B} x + \frac{x_A y_B - x_B y_A}{x_A - x_B}$$

$$\tan_A(x) = f'(x_A) (x - x_A) + y_A$$

Integração e derivação funções cúbicas



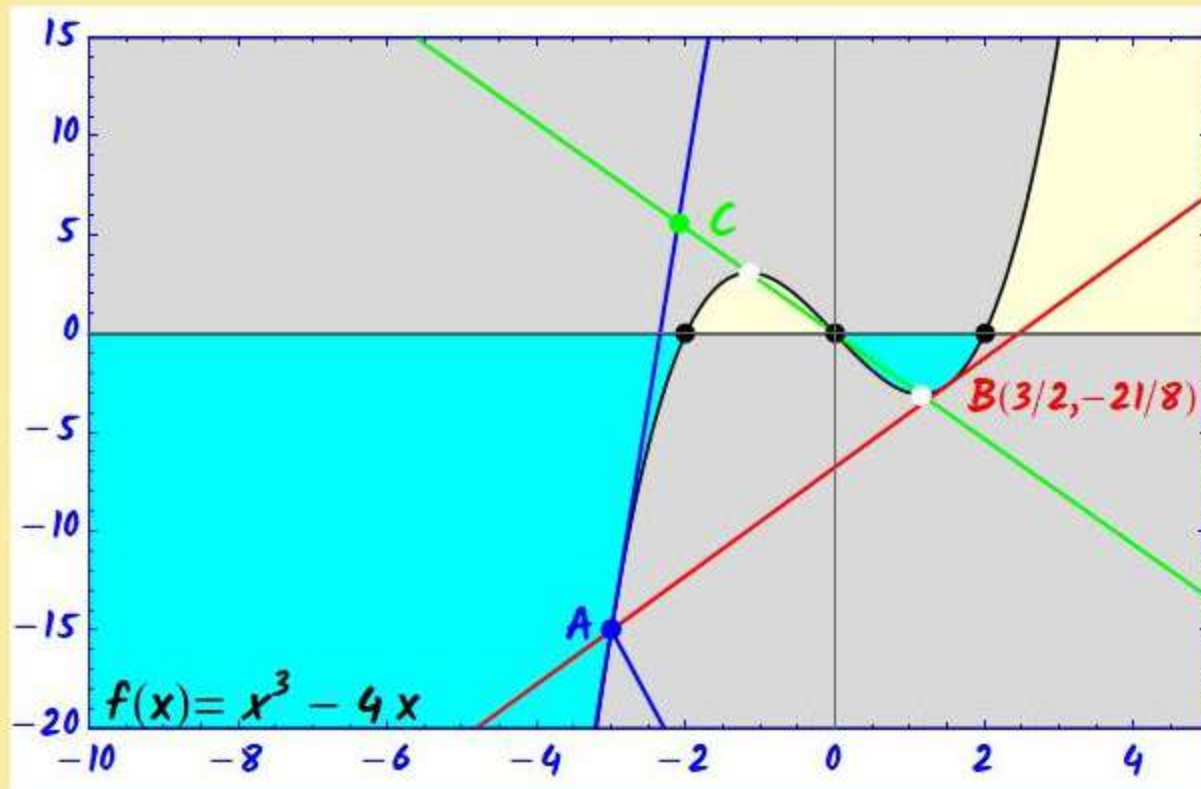
Max, min, zeros, reta tangente em B



Integração e derivação funções cúbicas

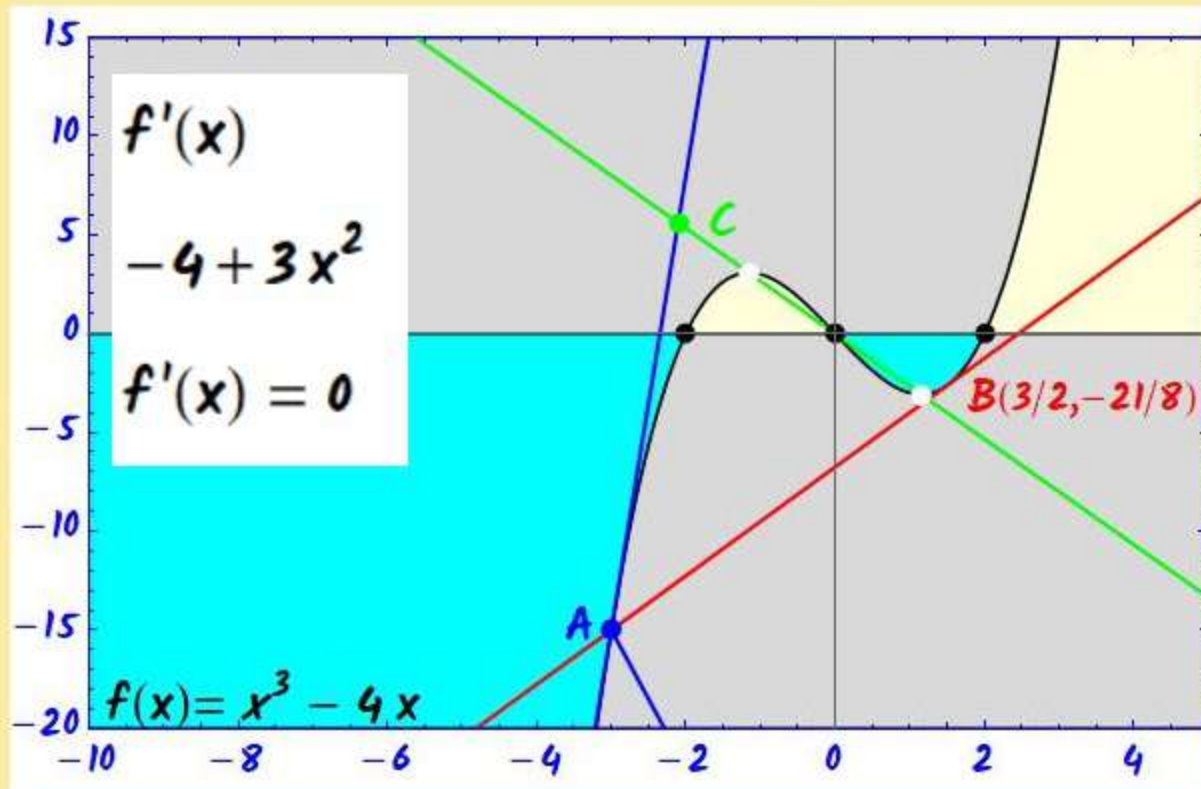


Max, min, zeros, reta tangente em B

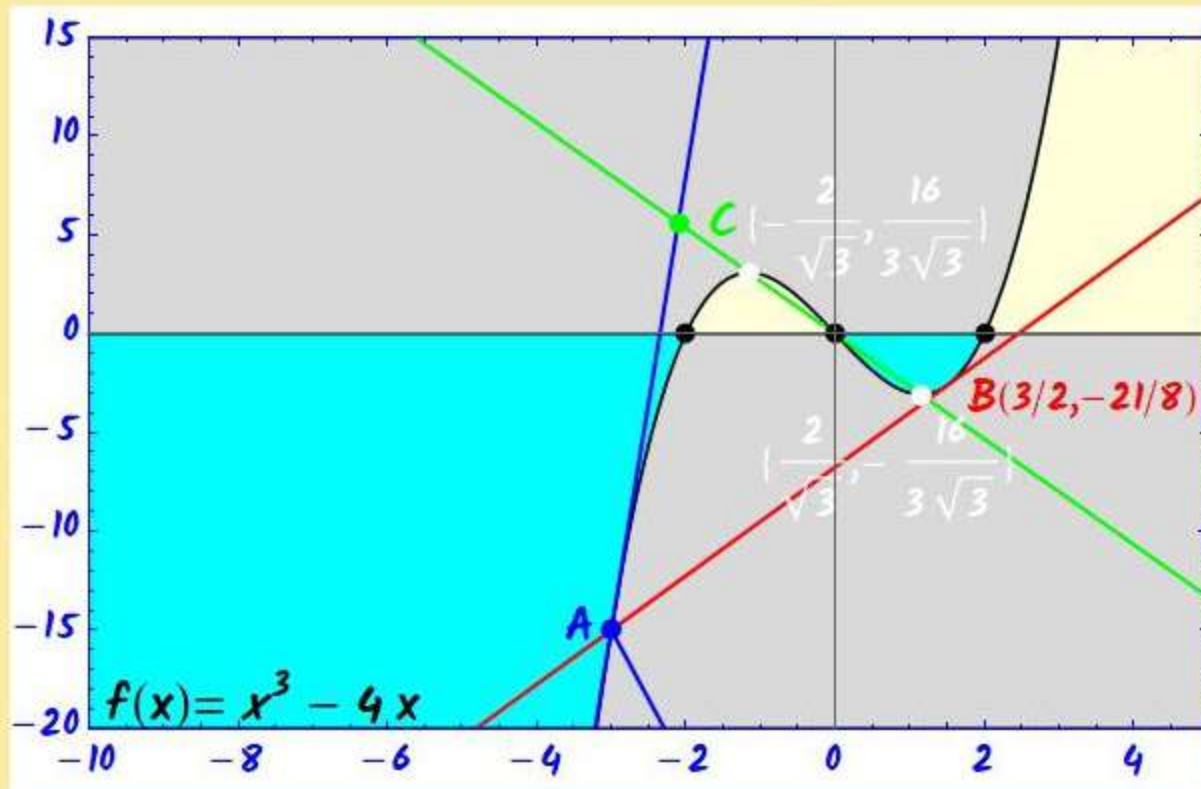


A, reta tangente em A, reta max/min, C

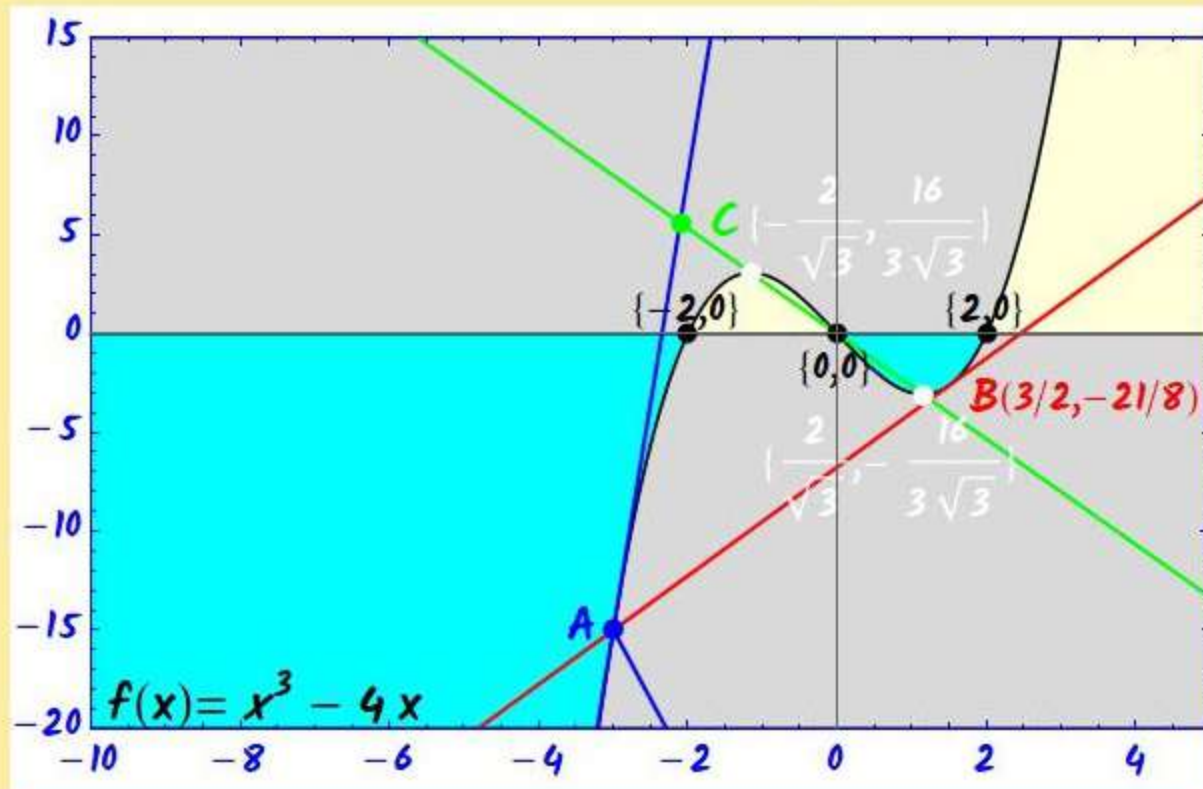
Integração e derivação funções cúbicas



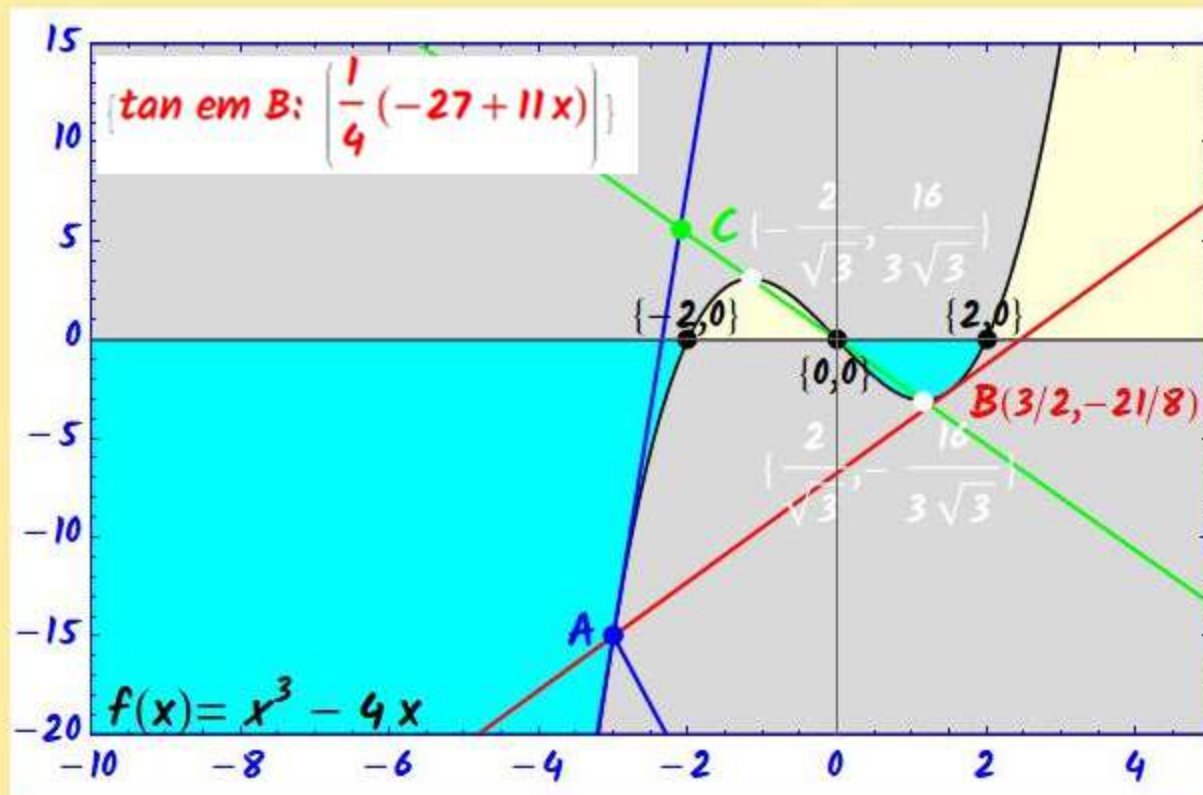
Integração e derivação funções cúbicas



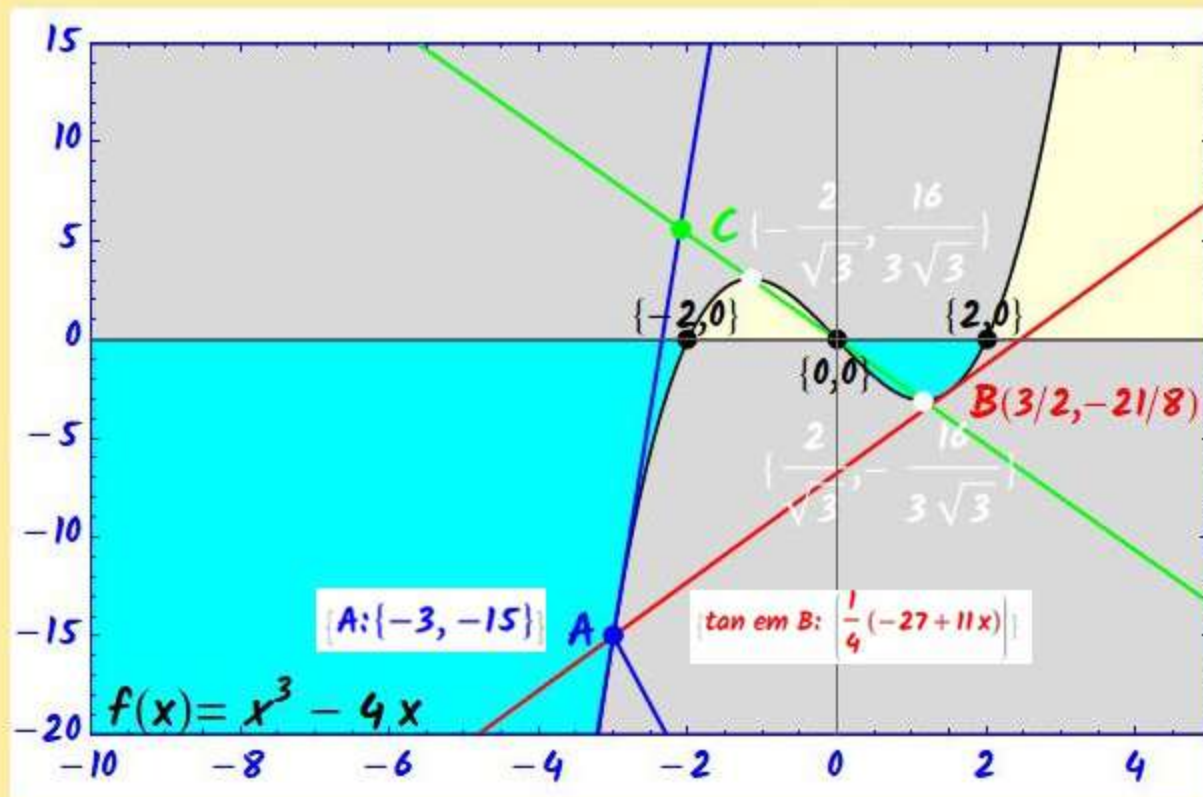
Integração e derivação funções cúbicas



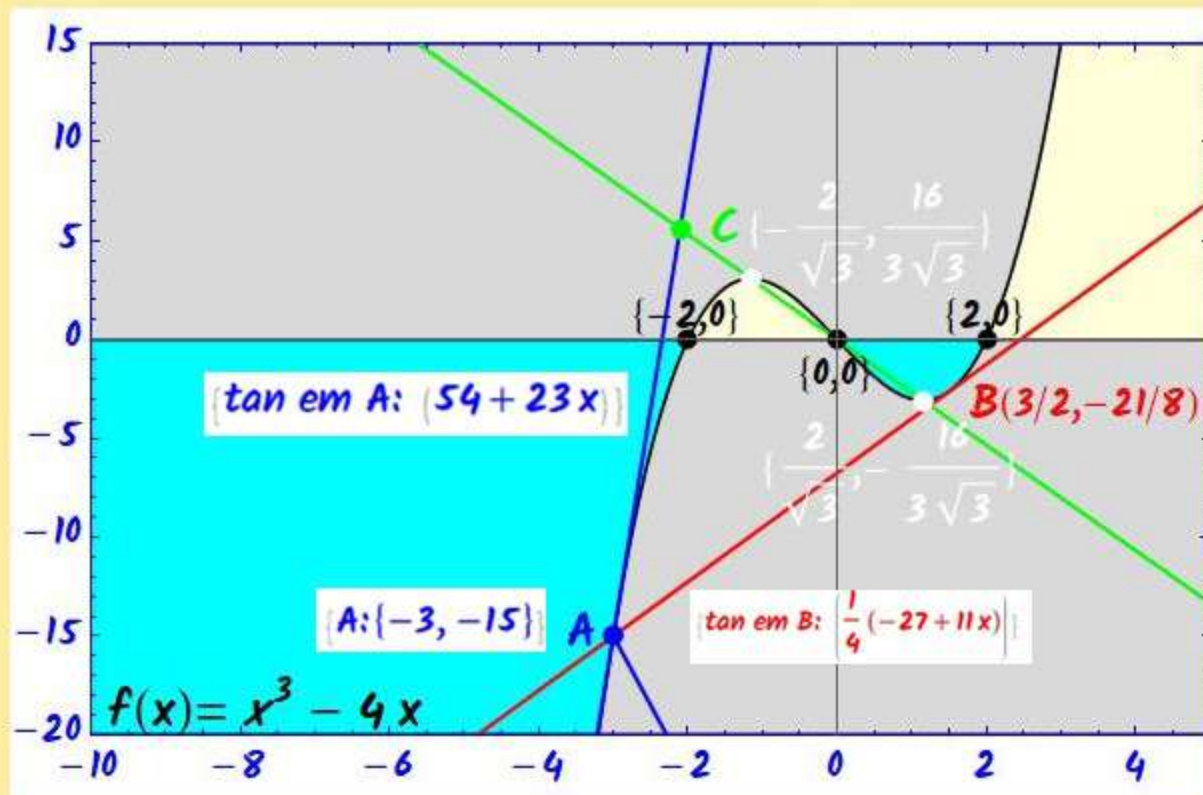
Integração e derivação funções cúbicas



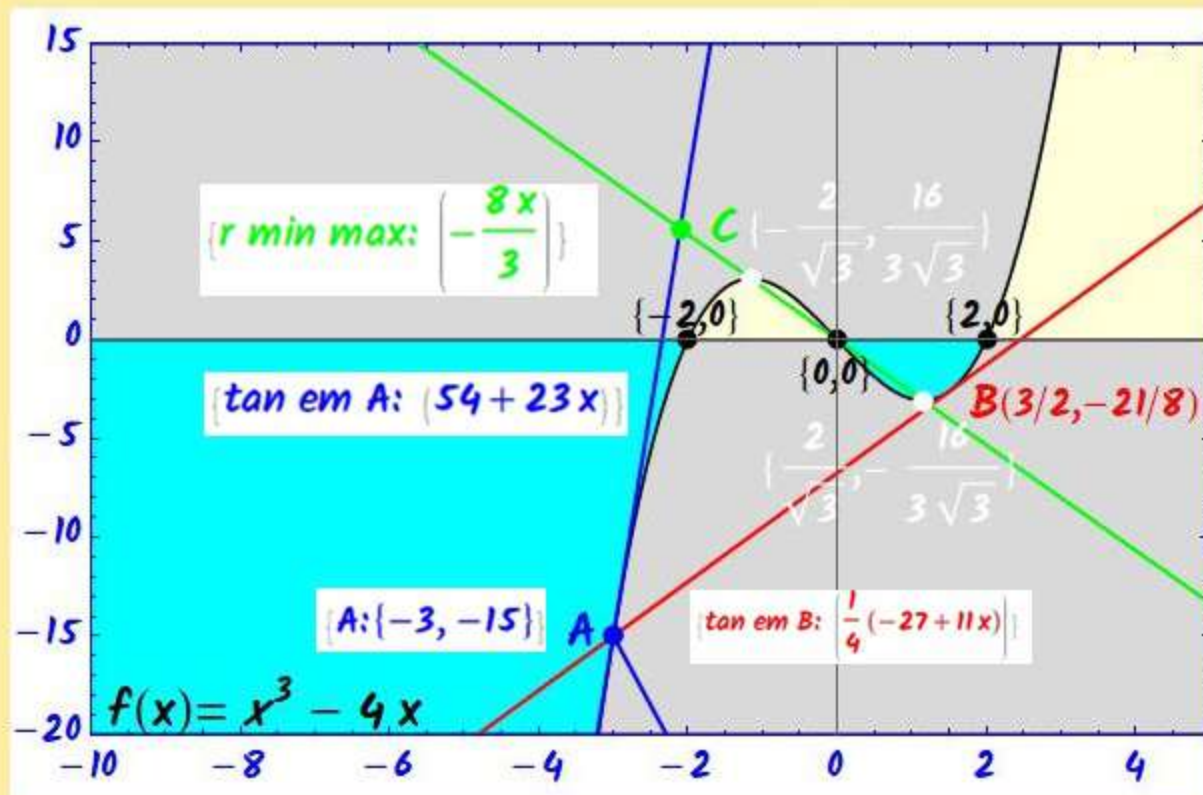
Integração e derivação funções cúbicas



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