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Prova 2 - Calculo I

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2- Altura = h   largura = l A_I : h . l

Área total

$A_T = (l + 2 + 2,5).(h + 3,5 + 2) = (l + 4,5).(h + 5,5)$

$A_I = h.l$ e $375 = h.l$ = $h = \frac{375}{l}$

Substituindo A_T temos: $A_T = (l + 4,5)\left(\frac{375}{l} + 5,5\right) = (l + 4,5)\left(\frac{375 + 5,5}{l}\right)$

$A_T = \frac{5,5l + 399,75l + 1687,5}{l}$

$A'(l) = \left[\frac{5,5\,l^2 + 399,75l + 2687,5}{l}\right]'$

$A'(l) = \frac{(11l + 399,75)l - (5,5l^2 + 399,75l + 2687,5).1}{l^2}$

$A'(l) = 0 = 11l^2 - 5,5l^2 + 399,75l - 399,75l - 1675 = 0$

$= 5,5l^2 - 1687,5 = 0 = 5,5l^2 = 1687,5$

$= l^2 = \frac{1687,5}{5,5} = 306,818$

$= l = \pm\sqrt{306,818} \rightarrow l = 17,51$ $\rightarrow h = \frac{375}{l}$ $\rightarrow h = \frac{375}{17,51}$ $\boxed{21,41}$

$h = 21,41$ e $l = 17,51$

altura = $21,41 + 5,5 = 26,91$ cm

largura = $17,51 + 4,5 = 22,01$ cm

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1- $g(x) = x^4 - 2x^2 + 2$

a) Derivando:

$g(x) = 4x^3 - 4x$ $\qquad$ $4x = 0$ / $x^2 - 1 = 0$

$4x^3 - 4x = 0$ $\qquad$ $x = 0$ $\qquad$ $x^2 = 1$

$4x(x^2 - 1) = 0$ $\qquad$ $x = 1$ ou $x = -1$

$-1, 0, 1$ são números críticos

b) $g'(x) = 4x^3 - 4x$

$g'(x) > 0$ $\qquad$ $g'(x) = 0$ se $x = 1$ ou $x = -1$ ou $x = 0$

$g'(x) = 0$ $\qquad$ $g'(x) > 0$ se $x < -1$ ou $x > 1$

$g'(x) < 0$ se $-1 < x < 1$

g = Crescente $x < -1$ ou $x > 1$ $\qquad$ $-\infty < x < \infty$

g = Decrescente $-1 < x < 1$ $\qquad$ $(-\infty, \infty)$

c) $g''(x) = 12x^2 - 4$

Para $x = -1$ = $g''(-1) = 12.(-1)^4 - 4 = 8$ $\qquad$ $8 > 0$: Mínimo

Para $x = 0$ = $g''(0) = 12(0)^8 - 4 = -4$ $\qquad$ $-4 < 0$: Máximo

Para $x = 1$ = $g''(1) = 12.1^2 - 4 = 8$ $\qquad$ $8 > 0$: mínimo

$g''(x) = x^4 - 2x^2 + 2$

$g''(-1) = (-1)^4 - 2.(-1)^2 + 2 = 1 - 2 + 2 = 1$ $\qquad$ $(-1, 1)$ = Mínimo

$g''(0) = 0^4 - 2.0^2 + 2 = 2$ $\qquad$ $(0, 2)$ = máximo

$g''(1) = 1^4 - 2.1^2 + 2 = 1 - 2 + 2 = 1$ $\qquad$ $(1, 1)$ = mínimo

Ponto mínimo $\longrightarrow$ $(-1, 1)$ e $(1, 1)$

Ponto máximo $\longrightarrow$ $(0, 2)$

1-d) $g(x) = x^4 - 2x^2 + 2$

$g'(x) = \frac{d}{dx}(x^4 - 2x^2 + 2)$

$g'(x) = 4x^3 - 2.2x + 0$

$g'(x) = 4x^3 - 4x$

$0 = 12x^2 - 4$ $\qquad x^2 = \frac{1}{3}$ - $x \pm \frac{\sqrt{3}}{3}$

$-12x^2 = -4$

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

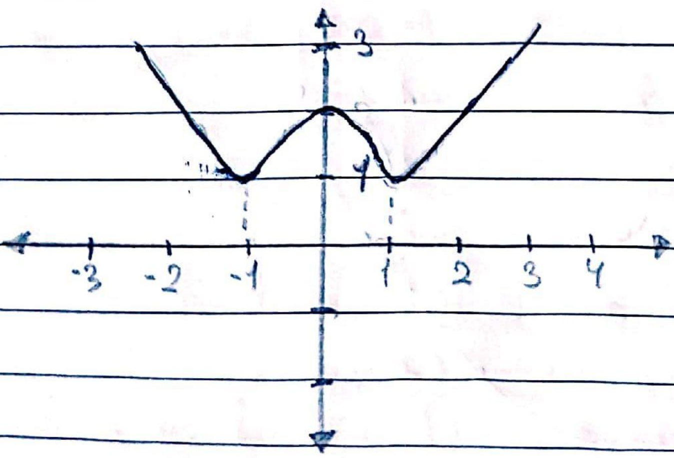
$g\left(\frac{-\sqrt{3}}{3}\right) = \frac{9}{81} - \frac{2}{3} + 2$

$g\left(-\frac{\sqrt{3}}{3}\right) = \frac{13}{9}$

Mesmo processo para o segundo, só muda o x

$\left(-\frac{\sqrt{3}}{3}, \frac{13}{9}\right)$ e $\left(\frac{\sqrt{3}}{3}, \frac{13}{9}\right)$

e)



4- i) $\int sen^4(2x) \cos(2x)\, dx$

$$\int sen^4(2x) \cos(2x) \cdot \frac{1}{\cos(2x) \cdot 2} \cdot dt$$

$$\int sen^4(2x) \cdot \frac{1}{2}\, dt$$

$$\int \frac{sen^4(2x)}{2}\, dt = \int \frac{t^4}{2}\, dt = \frac{1}{2} \cdot \frac{t^5}{5} = \frac{1}{2} \cdot \frac{sen(2x)^5}{5}$$

$$\frac{sen(2x)^5}{10} = \frac{sen(2x)^5}{10} + C$$

ii) $\int 4x^2 e^x\, dx$

$4(x^2 \cdot e^x - \int e^x \cdot 2x\, dx =$

$4(x^2 e^x - 2 \cdot \int e^x x\, dx) =$

$4(x^2 e^x - 2 \cdot \int x e^x\, dx) =$

$4(x^2 e^x - 2(x e^x - \int e^x\, dx))$

$4(x^2 e^x - 2(x e^x - e^x)$

$4(x^2 e^x - 2x e^x + 2 e^x) = (4x^2 e^x - 8x e^x + 8 e^x) =$

$$\boxed{4x^2 e^x - 8x e^x + 8 e^x + C}$$

5- $y = e^{-x}$, $y = x+1$, $x = -1$

$$\int_{-1}^{x+1} (e^{-x})\,dx$$

Substituindo $u = -x$ = $du = -1\,dx$ $\quad dx = (-1)\,du$

$= \int e^{u}(-1)\,du$

$= \int -e^{u}\,du$ $\qquad x = -1 \quad u = 1 \rightarrow u = -x = -(-1) = 1$

$x = x+1 \quad u = -x-1$

$$\int_{1}^{-x-1} -e^{u}\,du$$

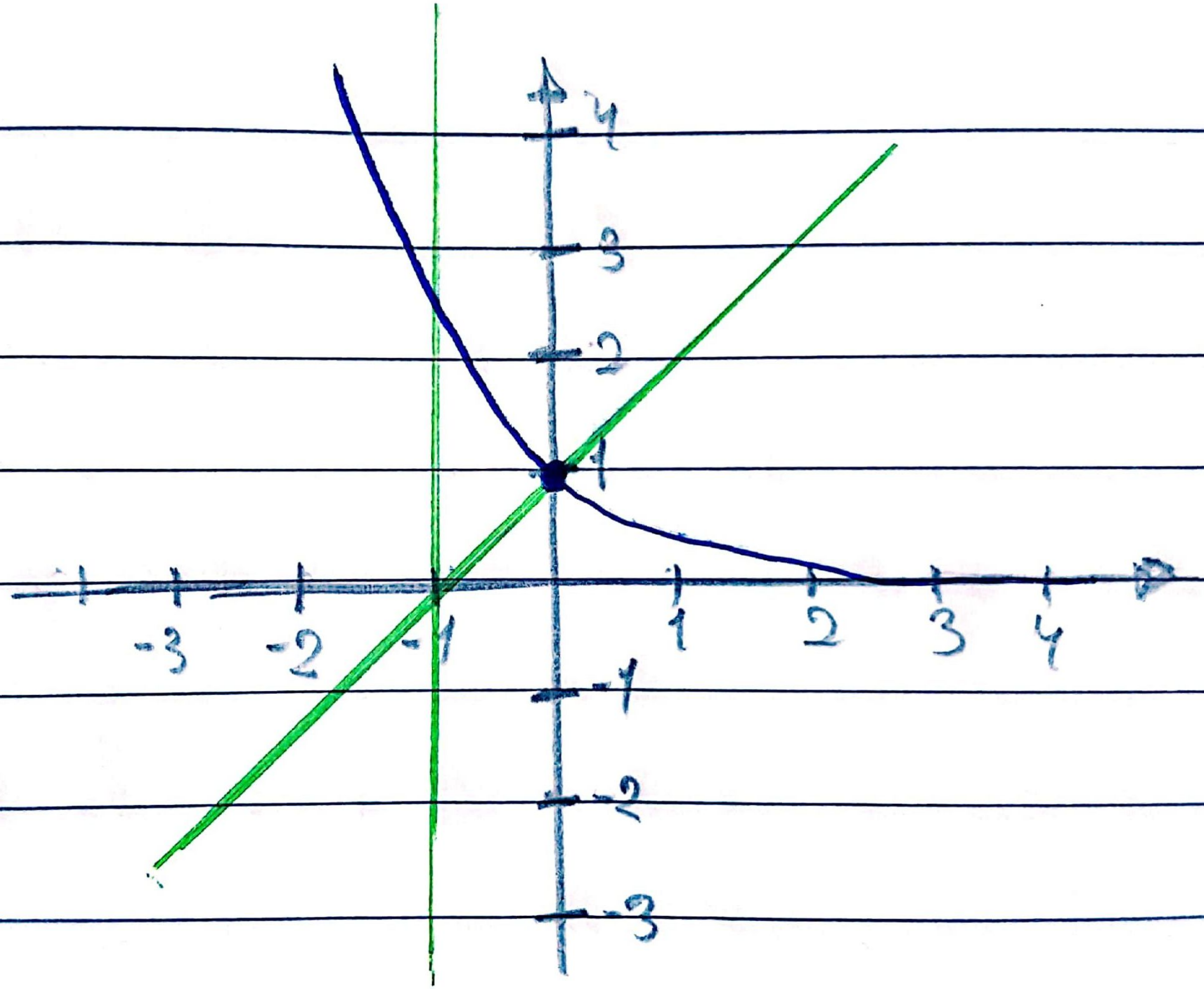
$= -\left[e^{u}\right]_{1}^{-x-1}$ $\quad = \int_a^b f(x)\,dx = F(b) - F(a) = \lim_{x \to b^-} (F(x)) - \lim_{x \to a^+} (F(x))$

$\lim_{u \to 1^+} (e^{u}) = e$

$\lim_{u \to -x-1^-} (e^{u}) = e^{-x-1}$

$= e^{-x-1} \longrightarrow e^{-x-1} - e \longrightarrow -(-e^{-x-1} - e) =$

$$\boxed{= -e^{-x-1} + e}$$



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3- $x_1 = a + \Delta x = x_1 = 0 + 1 = 1$; $f(x) = -2x$

$x_2 = 0 + 2 \cdot 1 = x_2 = 2$

$\Delta x = \frac{b-a}{2} =$ $\quad R_m = f(x_1)\Delta x + f(x_2)\Delta x$

$-2 \cdot 1 + (-2 \cdot 2) = \frac{-2}{1} + \frac{-2}{2} = \frac{(-4) \cdot (-2)}{2} = \frac{8}{2}$

$\Delta x = \frac{2-0}{2} = 1$

$\Delta x = \frac{2-0}{4} = 0{,}5$

$x_1 = 0 + 0{,}5 = 0{,}5$

$x_2 = 0 + 2{,}05 = 1$ $\quad \frac{8}{2}$ u.a

$x_3 = 0 + 3{,}05 = 1{,}5$

$x_4 = 0 + 4{,}0{,}5 = 2$

$\Delta x = \frac{2-0}{8} = 0{,}25$

$x_1 = 0 + 0{,}25 = 0{,}25$

$x_2 = 0 + 2 \cdot 0{,}25 = 0{,}50$

$x_3 = 0 + 3 \cdot 0{,}25 = 0{,}75$

$x_4 = 0 + 4 \cdot 0{,}25 = 1$

$x_5 = 0 + 5 \cdot 0{,}25 = 1{,}25$

$x_6 = 0 + 6 \cdot 0{,}25 = 1{,}50$ $\quad \frac{8}{2}$ u.a

$x_7 = 0 + 7 \cdot 0{,}25 = 1{,}75$

$x_8 = 0 + 8 \cdot 0{,}25 = 2$