LISTA 1

1. Encontre a diferencial da função.

   (a) $y = x^2 \operatorname{sen}(2x)$

   (b) $y = \ln \sqrt{1+t^2}$

   (c) $y = \dfrac{u+1}{u-1}$

   (d) $y = (1+r^3)^{-2}$

2. Encontre Δy, dy e $\Delta y - dy$ para os valores dados de x e dx.

   (a) $y = e^{x/10}$, $x = 0$, $dx = 0,1$

   (b) $y = \operatorname{tg}(x)$, $x = \pi/4$, $dx = -0,1$

3. Encontre as primitivas de cada função.

   (a) $f(x) = \frac{1}{2} + \frac{3}{4}x^2 - \frac{4}{5}x^3$

   (b) $f(x) = (x+1)(2x-1)$

   (c) $f(x) = 5x^{1/4} - 7x^{3/4}$

   (d) $f(x) = 6\sqrt{x} - \sqrt[6]{x}$

   (e) $f(x) = \dfrac{10}{x^9}$

   (f) $f(u) = \dfrac{u^4 + 3\sqrt{u}}{u^2}$

   (g) $g(\theta) = \cos(\theta) - 5\operatorname{sen}(\theta)$

   (h) $f(x) = \dfrac{x^5 - x^3 + 2x}{x^4}$

4. Encontre f.

   (a) $f''(x) = 6x + 12x^2$

   (b) $f''(x) = \frac{2}{3}x^{2/3}$

   (c) $f'''(x) = e^x$

   (d) $f'(x) = \sqrt{x}(6+5x)$, $f(1) = 10$

   (e) $f'(t) = 2\cos(t) + \sec^2(t)$, $-\pi/2 < t < \pi/2$, $f(\pi/3) = 4$

   (f) $f'(x) = x^{-1/3}$, $f(1) = 1$, $f(-1) = -1$

   (g) $f''(x) = 24x^2 + 2x + 10$, $f(1) = 5$, $f'(1) = -3$

   (h) $f''(\theta) = \operatorname{sen}(\theta) + \cos(\theta)$, $f(0) = 3$, $f'(0) = 4$

   (i) $f''(x) = 2 - 12x$, $f(0) = 9$, $f(2) = 15$

   (j) $f''(x) = 2 + \cos(x)$, $f(0) = -1$, $f(\pi/2) = 0$

   (k) $f''(x) = x^{-2}$, $x > 0$, $f(1) = 0$, $f(2) = 0$

5. Dado que o gráfico de f passa pelo ponto $(1,6)$ e que a inclinação de sua reta tangente em $(x, f(x))$ é $2x+1$, encontre $f(2)$.

6. Uma partícula move-se de acordo com os dados a seguir. Encontre a posição da partícula.

(a) $v(t) = \text{sen}(t) - \cos(t)$, $s(0) = 0$
(b) $a(t) = t - 2$, $s(0) = 1$, $v(0) = 3$
(c) $a(t) = 10\,\text{sen}(t) + 3\cos(t)$, $s(0) = 0$, $s(1) = 20$

7. Verifique, por derivação, que a fórmula está correta.

   (a) $\displaystyle\int \frac{x}{\sqrt{x^2+1}}\,dx = \sqrt{x^2+1} + C$
   (b) $\int \cos^3(x)dx = \text{sen}(x) - \frac{1}{3}\,\text{sen}^3(x) + C$

8. Encontre a integral indefinida.

   (a) $\int (x^2 + x^{-2})\ dx$
   (b) $\int (x^3 + 6x + 1)\ dx$
   (c) $\int (1-t)(2+t^2)\ dt$
   (d) $\displaystyle\int \frac{x^3 - 2\sqrt{x}}{x}\ dx$
   (e) $\int (\theta - \text{cossec}(\theta)\,\text{cotg}(\theta))\ d\theta$
   (f) $\int (1 + \text{tg}^2(\alpha))\ d\alpha$

9. Calcule a integral indefinida fazendo a substituição dada.

   (a) $\int \cos(3x)\ dx$, $u = 3x$
   (b) $\int x^2\sqrt{x^3+1}\ dx$, $u = x^3 + 1$
   (c) $\displaystyle\int \frac{4}{(1+2x)^3}\ dx$, $u = 1 + 2x$

10. Calcule a integral indefinida.

   (a) $\int x\,\text{sen}(x^2)\ dx$
   (b) $\int (3x-2)^{20}\ dx$
   (c) $\int (x+1)\sqrt{2x+x^2}\ dx$
   (d) $\displaystyle\int \frac{dx}{5-3x}$
   (e) $\int \text{sen}(\pi t)\ dt$
   (f) $\displaystyle\int \frac{a+bx^2}{\sqrt{3ax+bx^3}}\ dx$
   (g) $\displaystyle\int \frac{(\ln x)^2}{x}\ dx$
   (h) $\displaystyle\int \frac{\cos(\sqrt{t})}{\sqrt{t}}\ dt$
   (i) $\int \cos(\theta)\,\text{sen}^6(\theta)\ d\theta$
   (j) $\int e^x\sqrt{1+e^x}\ dx$
   (k) $\displaystyle\int \frac{z^2}{\sqrt[3]{1+z^3}}\ dz$
   (l) $\int e^{\text{tg}(x)}\sec^2(x)\ dx$
   (m) $\displaystyle\int \frac{\cos(x)}{\text{sen}^2(x)}\ dx$
   (n) $\int \sqrt{\text{cotg}(x)}\,\text{cossec}^2(x)\ dx$
   (o) $\displaystyle\int \frac{\text{sen}(2x)}{1+\cos^2(x)}\ dx$
   (p) $\int \text{cotg}(x)\ dx$
   (q) $\displaystyle\int \frac{dx}{\sqrt{1-x^2}\,\text{sen}^{-1}(x)}$
   (r) $\displaystyle\int \frac{1+x}{1+x^2}\ dx$
   (s) $\displaystyle\int \frac{x}{\sqrt[4]{x+2}}\ dx$

11. Encontre a derivada da função.

(a) $g(x) = \displaystyle\int_1^x \frac{1}{t^3+1}\, dt$

(b) $g(y) = \int_2^y t^2 \operatorname{sen}(t)\, dt$

(c) $F(x) = \int_x^\pi \sqrt{1+\sec(t)}\, dt$

(d) $h(x) = \int_2^{1/x} \operatorname{arctg}(t)\, dt$

(e) $y = \int_0^{\operatorname{tg}(x)} \sqrt{t+\sqrt{t}}\, dt$

12. Calcule a integral definida.

(a) $\int_{-1}^2 (x^3 - 2x)\, dx$

(b) $\int_0^4 \sqrt{x}\, dx$

(c) $\displaystyle\int_1^2 \frac{3}{t^4}\, dt$

(d) $\int_0^2 x(2+x)^5\, dx$

(e) $\displaystyle\int_1^9 \frac{x-1}{\sqrt{x}}\, dx$

(f) $\int_0^{\pi/4} \sec^2(t)\, dt$

(g) $\displaystyle\int_{1/2}^{\sqrt{3}/2} \frac{6}{\sqrt{1-t^2}}\, dt$

(h) $\int_{-1}^1 e^{u+1}\, du$

(i) $\int_0^\pi f(x)\, dx$, $f(x) = \begin{cases} \operatorname{sen}(x), & \text{se } 0 \le x \le \pi/2 \\ \cos(x), & \text{se } \pi/2 \le x \le \pi \end{cases}$

13. Se $F(x) = \int_1^x f(t)\, dt$, onde $f(t) = \displaystyle\int_1^{t^2} \frac{\sqrt{1+u^4}}{u}\, du$, determine $F''(2)$.

14. Se $f(1) = 12$, f' é contínua e $\int_1^4 f'(x)\, dx = 17$, qual é o valor de $f(4)$?

15. Calcule a integral definida.

(a) $\int_{-1}^0 (2x - e^x)\, dx$

(b) $\int_{-2}^2 (3u+1)^2\, du$

(c) $\int_1^4 \sqrt{t}(1+t)\, dt$

(d) $\int_0^1 x(\sqrt[3]{x} + \sqrt[4]{x})\, dx$

(e) $\displaystyle\int_1^4 \sqrt{\frac{5}{x}}\, dx$

(f) $\int_0^\pi (4\operatorname{sen}(\theta) - 3\cos(\theta))\, d\theta$

(g) $\displaystyle\int_0^{\pi/4} \frac{1+\cos^2(\theta)}{\cos^2(\theta)}\, d\theta$

(h) $\displaystyle\int_1^{64} \frac{1+\sqrt[3]{x}}{\sqrt{x}}\, dx$

(i) $\displaystyle\int_0^{1/\sqrt{3}} \frac{t^2-1}{t^4-1}\, dt$

(j) $\int_{-1}^2 (x - 2|x|)\, dx$

16. Calcule a integral definida.

(a) $\int_0^2 (x-1)^{25}\, dx$

(b) $\int_0^1 x^2(1+2x^3)^5\, dx$

(c) $\int_0^\pi \sec^2(\frac{t}{4})\, dt$

(d) $\int_{-\pi/6}^{\pi/6} \operatorname{tg}^3(\theta)\, d\theta$

(e) $\displaystyle\int_1^2 \frac{e^{1/x}}{x^2}\, dx$

(f) $\displaystyle\int_0^{\pi/3} \frac{\operatorname{sen}(\theta)}{\cos^2(\theta)}\, d\theta$

(g) $\int_1^2 x\sqrt{x-1}\, dx$

(h) $\displaystyle\int_e^{e^4} \frac{dx}{\sqrt{\ln x}}\, dx$

(i) $\displaystyle\int_0^1 \frac{e^z+1}{e^z+z}\, dz$

17. Encontre a área da região que está sob a curva $y = \sqrt{2x+1}$, $0 \le x \le 1$.