Lista de exercícios: Cálculo Diferencial e Integral 1
Números Reais e Funções

A. Efetue as operações abaixo:

01) $\frac{2}{7}+\frac{3}{7}$ **02)** $\frac{5}{11}-\frac{8}{11}$ **03)** $\frac{7}{12}-\frac{11}{12}$ **04)** $\frac{9}{4}+\frac{3}{4}$ **05)** $-\frac{2}{9}-\frac{4}{9}$

06) $\frac{2}{3}+\frac{1}{4}$ **07)** $\frac{3}{5}-\frac{2}{7}$ **08)** $\frac{2}{9}-\frac{3}{4}$ **09)** $-\frac{5}{3}-\frac{7}{2}$ **10)** $\frac{3}{4}+\frac{5}{6}$

11) $\frac{5}{18}-\frac{7}{12}$ **12)** $-\frac{7}{30}-\frac{5}{24}$ **13)** $7+\frac{3}{4}$ **14)** $2-\frac{1}{3}$ **15)** $-3-\frac{2}{5}$

16) $\frac{1}{2}+\frac{2}{3}+\frac{1}{5}$ **17)** $\frac{5}{12}-\left(\frac{7}{36}-\frac{11}{30}\right)$ **18)** $\frac{3}{5}\cdot\frac{25}{9}$ **19)** $\frac{-8}{21}\cdot\frac{35}{12}$ **20)** $\frac{-42}{55}\cdot\frac{99}{-14}$

21) $\frac{\frac{2}{3}}{\frac{3}{4}}$ **22)** $\frac{\frac{4}{15}}{\frac{6}{65}}$ **23)** $\frac{-\frac{10}{63}}{\frac{85}{42}}$ **24)** $\frac{\frac{1}{5}+\frac{3}{7}}{2}$ **25)** $\frac{-\frac{4}{12}+\frac{5}{21}}{5}$

26) $\frac{-\frac{11}{39}-\frac{2}{15}}{27}$ **27)** $\frac{1+\frac{2}{3}}{3+\frac{5}{2}}$ **28)** $\frac{\frac{1}{2}+\frac{2}{7}}{\frac{1}{3}+\frac{2}{5}}$ **29)** $\frac{\frac{2}{9}-\frac{5}{6}}{-\frac{5}{12}+\frac{11}{27}}$ **30)** 5^3

31) 2^5 **32)** $(-4)^4$ **33)** $\left(-\frac{6}{7}\right)^3$ **34)** $\left(\frac{10}{9}\right)^2$ **35)** $(9)^{-2}$

36) $(-3)^{-3}$ **37)** $\left(\frac{2}{3}\right)^{-4}$ **38)** $\left(-\frac{1}{2}\right)^{-7}$ **39)** $\left(-\frac{423}{389}\right)^0$ **40)** $\sqrt{81}$

41) $\sqrt[4]{81}$ **42)** $\sqrt[3]{64}$ **43)** $\sqrt[5]{32}$ **44)** $\sqrt{\frac{49}{64}}$ **45)** $\sqrt[3]{\frac{-8}{27}}$

46) $125^{1/3}$ **47)** $4^{3/2}$ **48)** $(-8)^{2/3}$ **49)** $-(8)^{2/3}$ **50)** $9^{-3/2}$

51) $49^{-1/2}$ **52)** $\left(\frac{27}{8}\right)^{-4/3}$ **53)** $\left(\frac{1}{32}\right)^{-2/5}$

B. Calcule:

01) $71-(2^5-3\cdot 3)+\sqrt{49}$

02) $20-\left(\frac{-45}{(-3)^2}\right)+(-2)\cdot(-1)^5$

03) $(-1)^4-1^4+(-2)^5-(-2)^3+0^{100}+100^0+8\cdot 2^2$

04) $-(-3)^3-\left(2^3\right)^2$

05) $\sqrt[5]{1024}+2^3\cdot\left(\frac{6^2}{4}+\sqrt[3]{8}\right)$

06) $\frac{\frac{\left(\frac{2}{3}\right)^2}{\frac{2}{9}}}{3}+\frac{3}{4}$

07) $\dfrac{\left(1-\frac{1}{2}\right)^2}{\frac{3}{4}}+\dfrac{\frac{1}{5}}{\left(1-\frac{4}{5}\right)^2}$

08) $\dfrac{4\sqrt[3]{8}-3\sqrt[5]{32}}{2}$

09) $\dfrac{\left(-\frac{1}{2}+\frac{1}{3}\right)^2\cdot\left(1+\frac{1}{5}\right)}{-\frac{3}{5}\cdot\left(-2+\frac{1}{3}\right)^2}$

10) $2\sqrt{80}+\sqrt{45}-3\sqrt{125}$

11) $\sqrt[5]{31+\sqrt[6]{10-\sqrt{83-\sqrt{4}}}}$

12) $\left(\sqrt[3]{\sqrt[6]{2^9}}\right)^4$

13) $\dfrac{2+\sqrt{3}}{1-\sqrt{5}}+\dfrac{2-\sqrt{3}}{1+\sqrt{5}}$

14) $\sqrt[3]{\dfrac{64}{125}}+\left(\dfrac{27}{8}\right)^{-\frac{2}{3}}$

C. Fatore as expressões abaixo, colocando o fator comum em evidência:

01) $7x-21$ **02)** $8x^2-48x$ **03)** xy^2+3x^2y-xy **04)** $4x(x-1)-8(x-1)$

D. Fatore as diferenças de quadrados:

01) x^2-36 **02)** $4x^2-49$ **03)** $81-x^2$ **04)** $25-9x^2$

05) $4-(x+1)^2$ **06)** $(x+2)^2-(x-1)^2$ **07)** $(2x-3)^2-(3x+4)^2$ **08)** x^4-81

E. Fatore as expressões utilizando soma/produto:

01) $x^2+9x+14$ **02)** $x^2+8x+15$ **03)** $x^2+7x+12$ **04)** $x^2+13x+40$

05) x^2-3x+2 **06)** $x^2-10x+21$ **07)** $x^2-11x+18$ **08)** $x^2-15x+36$

09) x^2+x-6 **10)** $x^2+3x-28$ **11)** $x^2+2x-80$ **12)** $x^2+11x-26$

13) $x^2-2x-24$ **14)** $x^2-9x-36$ **15)** x^2-x-30 **16)** $x^2-10x-56$

17) $-x^2+8x-12$ **18)** $2x^2-2x-24$ **19)** $-3x^2-18x-27$ **20)** $2x^2-3x-2$

F. Simplifique as expressões abaixo:

01) $\dfrac{18x^3}{15x}$ **02)** $\dfrac{84x^2}{90x^6}$ **03)** $\dfrac{5x-15}{6x-18}$ **04)** $\dfrac{7x-28}{4-x}$

05) $\dfrac{x^4}{x^2-4x}$ **06)** $\dfrac{x^2-25}{x-5}$ **07)** $\dfrac{4x^2+12x}{x^2-9}$ **08)** $\dfrac{36-x^2}{3x^3-18x^2}$

09) $\dfrac{x^2+4x+3}{7x^2+21x}$ **10)** $\dfrac{x^2-x-20}{50-2x^2}$ **11)** $\dfrac{x^2-2x-8}{x^2-12x+32}$ **12)** $\dfrac{2x^2-4x-6}{3x^2-15x+18}$

13) $\dfrac{4x^3+24x^2+20x}{7x^3-35x^2-42x}$ **14)** $\dfrac{x^2-a^2}{x-a}$ **15)** $\dfrac{x^4-16}{x-2}$ **16)** $\dfrac{x^4-a^4}{x-a}$

G. Efetue as operações e simplifique:

01) $\dfrac{8}{x^2-9}\cdot\dfrac{x-3}{12}$ **02)** $\dfrac{5x^2+10x}{9}\cdot\dfrac{12}{20x+40}$ **03)** $\dfrac{x^2+6x+8}{72-2x^2}\cdot\dfrac{x^2-2x-24}{x^2+8x+16}$

04) $\dfrac{\dfrac{x^2-9}{x^2+5x}}{\dfrac{x+3}{x^2}}$ **05)** $\dfrac{\dfrac{9x^2}{x^2+5x+4}}{\dfrac{3x}{4-4x^2}}$ **06)** $\dfrac{\dfrac{14-7x}{x^3+6x^2-7x}}{\dfrac{x^2-4}{x^2+x-2}}$

07) $\dfrac{4x+13}{3x^2+15x}+\dfrac{7}{3x^2+15x}$ **08)** $\dfrac{2x+5}{x^2-9}-\dfrac{5x-4}{x^2-9}$ **09)** $\dfrac{x+5}{x^2-3x}-\dfrac{1}{x-3}$

10) $\dfrac{x+20}{x^2-16}+\dfrac{2}{x+4}$ **11)** $\dfrac{x-1}{x^2+4x+3}-\dfrac{x-4}{x^2-x-2}$ **12)** $\dfrac{1}{x}+\dfrac{2}{x^2-2x}-\dfrac{6}{x^2-4}$

13) $\dfrac{3+\dfrac{2}{x-2}}{1+\dfrac{4}{x-2}}$ **14)** $\dfrac{1-\dfrac{3x+1}{x+3}}{\dfrac{7x-5}{x+1}-3}$ **15)** $\dfrac{\dfrac{1}{x}+\dfrac{1}{y}}{\dfrac{1}{x^2}-\dfrac{1}{y^2}}$

16) $\dfrac{\dfrac{1}{x+h}-\dfrac{1}{x}}{h}$ **17)** $\dfrac{\dfrac{1}{x^2}-\dfrac{1}{a^2}}{x-a}$ **18)** $\dfrac{\dfrac{x+h}{x+h-3}-\dfrac{x}{x-3}}{h}$

H. Simplifique $\dfrac{f(x)-f(a)}{x-a}$ $(x\neq a)$ para:

01) $f(x)=x^2$ e $a=3$. **02)** $f(x)=x^2$ e $a=-2$ **03)** $f(x)=5x^2+2x$ e $a=0$

04) $f(x)=3x-2$ e $a=2$ **05)** $f(x)=7-3x$ e $a=-1$ **06)** $f(x)=3$ e $a=11$

07) $f(x)=x^4$ e $a=3$ **08)** $f(x)=x^2-5x+1$ e $a=2$ **09)** $f(x)=\dfrac{1}{x}$ e $a=3$

10) $f(x)=x^2$ e a qualquer **11)** $f(x)=7-3x$ e a qualquer **12)** $f(x)=x^4$ e a qualquer

13) $f(x)=\dfrac{1}{x}$ e $a\neq 0$ **14)** $f(x)=\dfrac{1}{x^2}$ e $a\neq 0$ **15)** $f(x)=\dfrac{x}{x-2}$ e $a\neq 2$

I. Simplifique $\dfrac{f(x+h)-f(x)}{h}$ $(h\neq 0)$ para $f(x)$ igual a:

01) $x+7$ **02)** $2x-3$ **03)** $7-3x$ **04)** $-4x-5$

05) x^2 **06)** x^2-3x **07)** $3-2x^2$ **08)** x^2-2x+4

09) 3 **10)** $\dfrac{1}{x}$ **11)** $\dfrac{1}{x^2}$ **12)** $\dfrac{1}{3x+1}$

13) $\dfrac{1}{4-x}$ **14)** $\dfrac{2x-1}{3x+4}$ **15)** $\dfrac{x-3}{5-2x}$ **16)** $\dfrac{x+1}{x^2+2}$

J. Resolva as equações do primeiro grau:

01) $7x - 8 = 4x + 7$ **02)** $2x - 3 = 6x - 5$ **03)** $4 - 3x = 3x + 13$

04) $-7(x - 2) = 3x - 1$ **05)** $\dfrac{x-1}{2} + \dfrac{4x+3}{3} = 1$ **06)** $\dfrac{2x-1}{4} + \dfrac{x+3}{3} = \dfrac{5}{6}$

07) $\dfrac{2x+5}{5} - \dfrac{x-3}{2} = x$ **08)** $\dfrac{5x+24}{24} - \dfrac{5x-3}{8} = \dfrac{7-2x}{6}$ **09)** $\dfrac{2x+1}{x-2} = \dfrac{1}{2} + \dfrac{3x-2}{x-2}$

10) $\dfrac{5-4x}{x+3} = 3 - \dfrac{3x-4}{2x+6}$ **11)** $\dfrac{2}{4x-3} = \dfrac{3}{3-2x}$ **12)** $\dfrac{x-5}{x-1} = \dfrac{x+3}{x}$

L. Utilize completamento de quadrados para encontrar as raízes reais (se existirem) e esboçar os gráficos das funções do segundo grau abaixo:

01) $x^2 + 4x + 3$ **02)** $x^2 - 6x - 16$ **03)** $x^2 - 8x + 19$ **04)** $x^2 - 10x + 30$

05) $x^2 + 5x + 6$ **06)** $x^2 + 3x - 4$ **07)** $x^2 + x + 2$ **08)** $x^2 + 7x + 15$

09) $-x^2 + 6x - 8$ **10)** $4x^2 + 16x - 7$ **11)** $x^2 - 6x + 7$ **12)** $x^2 + x - 1$

M. Fatore os polinômios abaixo utilizando o algoritmo de Briot-Ruffini:

01) $x^3 + 2x^2 - 5x - 6$ **02)** $x^3 - 12x - 16$ **03)** $x^3 - 5x^2 + 7x + 13$

04) $x^4 + 2x^3 - 7x^2 - 8x + 12$ **05)** $x^4 + 2x^3 - 11x^2 - 12x + 36$ **06)** $x^5 - 3x^4 - x^3 + 11x^2 - 12x + 4$

N. Resolva as inequações:

01) $3x + 3 < x + 6$ **02)** $x - 3 > 3x + 1$ **03)** $x + 2 \leq 6x - 2$

04) $(2x - 1)(x + 3) > 0$ **05)** $(3 - 2x)(x^2 + 1) < 0$ **06)** $(2x - 3)(4 - 5x)(-4x + 3) \geq 0$

07) $\dfrac{2x-1}{x+1} < 0$ **08)** $\dfrac{1-x}{x-3} \geq 0$ **09)** $\dfrac{x}{2x-3} \leq 3$

10) $\dfrac{x-1}{x-2} \leq \dfrac{x+3}{x+4}$ **11)** $x^4 + x + 6 < x^3 + 7x^2$ **12)** $\dfrac{1}{(x-1)^2(x-2)} \geq \dfrac{1}{(x^2-1)(x+3)}$

13) $\dfrac{x^3 + 3x^2 - 4x - 12}{x^2 + 4x - 5} \geq 0$ **14)** $\dfrac{1}{x^2 - x - 6} \leq \dfrac{2}{x^2 - 2x - 8}$ **15)** $\dfrac{1}{x^3 - 2x^2 - x + 2} \leq \dfrac{1}{x^3 - 3x^2 - 4x + 12}$

16) $\dfrac{x^3 + 32}{x^3 - x^2 - 8x + 12} \geq 1$ **17)** $\dfrac{x-5}{x^4 - 4x^3 + 3x^2 + 4x - 4} \leq \dfrac{x-3}{x^4 - 5x^2 + 4}$

O. Utilize estudo de sinais para eliminar o módulo das seguintes expressões:

01) $|x - 3|$ **02)** $|2x - 7|$ **03)** $|x^2 - x - 2|$ **04)** $|x^3 - 2x^2 - 5x + 6|$

05) $|x - 1| + 2x + 3$ **06)** $|x - 2| + |2x + 3|$ **07)** $|x^2 - 4| - 2|x - 1|$ **08)** $|x^2 + 2x - 15| - |5x - 2|$