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8 DERIVADAS SUCESSIVAS DE UMA FUNÇÃO ⇒ PÁGINA 205 DO LIVRO MATEMÁTICA 1 PARA OS CURSOS DE ECONOMIA, ADMINISTRAÇÃO E CIÊNCIAS CONTÁBEIS (MEDEIROS, 5ª EDIÇÃO, EDITORA ATLAS)

1) $y = K$ (CONSTANTE)

$y' = (K)'$ $\quad y'' = (0)'$ $\quad y''' = (0)'$

$y' = 0$ $\quad y'' = 0$ $\quad y''' = 0$

2) $y = x$

$y' = (x)'$ $\quad y'' = (1)'$ $\quad y''' = (0)'$

$y' = 1$ $\quad y'' = 0$ $\quad y''' = 0$

3) $y = x^6$

$y' = (x^6)'$

$y' = 6x^{6-1}$

$y' = 6x^5$

$y'' = (6x^5)'$

$y'' = 6(x^5)'$

$y'' = 6(5x^{5-1})$

$y'' = 6(5x^4)$

$y'' = 30x^4$

$y''' = (30x^4)'$

$y''' = 30(x^4)'$

$y''' = 30(4x^{4-1})$

$y''' = 30(4x^3)$

$y''' = 120x^3$

4) $y = x^4 - 3x^3 + 2x + 1$

$y' = (x^4 - 3x^3 + 2x + 1)'$

$y' = (x^4)' - (3x^3)' + (2x)' + (1)'$

$y' = (4x^{4-1}) - 3(x^3)' + 2 + 0$

$y' = 4x^3 - 3(3x^{3-1}) + 2$

$y' = 4x^3 - 3(3x^2) + 2$

$y' = 4x^3 - 9x^2 + 2$

$y'' = (4x^3 - 9x^2 + 2)'$

$y'' = (4x^3)' - (9x^2)' + (2)'$

$y'' = 4(x^3)' - 9(x^2)' + 0$

$y'' = 4(3x^{3-1}) - 9(2x^{2-1})$

$y'' = 4(3x^2) - 9(2x)$

$y'' = 12x^2 - 18x$

$y''' = (12x^2 - 18x)'$

$y''' = (12x^2)' - (18x)'$

$y''' = 12(x^2)' - 18(x)'$

$y''' = 12(2x^{2-1}) - 18 \cdot 1$

$y''' = 12(2x) - 18$

$y''' = 24x - 18$

(5) $y = \frac{2}{x} \Rightarrow y = 2x^{-1}$

$y' = (2x^{-1})'$
$y' = 2(x^{-1})'$
$y' = 2(-1x^{-1-1})$
$y' = 2(-x^{-2})$
$y' = -2x^{-2}$
$y' = -\frac{2}{x^2}$

$y'' = (-2x^{-2})'$
$y'' = -2(x^{-2})'$
$y'' = -2(-2x^{-2-1})$
$y'' = -2(-2x^{-3})$
$y'' = 4x^{-3}$
$y'' = \frac{4}{x^3}$

$y''' = (4x^{-3})'$
$y''' = 4(x^{-3})'$
$y''' = 4(-3x^{-3-1})$
$y''' = 4(-3x^{-4})$
$y''' = -12x^{-4}$
$y''' = -\frac{12}{x^4}$

(6) $y = \sqrt{5x} \Rightarrow y = (5x)^{1/2}$ $\quad (5x)^{1/2} = x^{\cancel{0}}$

$y' = [(5x)^{1/2}]'$
$y' = \frac{1}{2}(5x)^{1/2-1} \cdot (5x)'$
$y' = \frac{1}{2}(5x)^{-1/2} \cdot 5$
$y' = \frac{1}{2} \cdot \frac{1}{(5x)^{1/2}} \cdot 5$
$y' = \frac{1}{2} \frac{1}{\sqrt{5x}} \cdot 5$
$y' = \frac{5}{2\sqrt{5x}}$

DERIVADA PRIMEIRA

$y'' = \left(\frac{5}{2\sqrt{5x}}\right)'$
$y'' = \frac{(5)' 2\sqrt{5x} - 5(2\sqrt{5x})'}{(2\sqrt{5x})^2}$
$y'' = \frac{0 \cdot 2\sqrt{5x} - 5 \cdot 2(\sqrt{5x})'}{4(\sqrt{5x})^2}$
$y'' = \frac{0 - \cancel{10}^{5}\left(\frac{5}{\cancel{2}\sqrt{5x}}\right)}{4(\sqrt{5x})^2}$
$y'' = \frac{-\frac{25}{\sqrt{5x}}}{4(\sqrt{5x})^2}$
$y'' = \frac{-25}{\sqrt{5x}} \cdot \frac{1}{4(\sqrt{5x})^2}$
$y'' = \frac{-25}{4(\sqrt{5x})^3}$

DERIVADA SEGUNDA

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$$y''' = \left(\frac{-25}{4(\sqrt{5x})^3} \right)' \qquad (5x)^{3/2} = u^{\varnothing}$$

$$y''' = -\frac{25}{4} \left(\frac{1}{(\sqrt{5x})^3} \right)'$$

$$y''' = -\frac{25}{4} \left\{ \frac{(1)'(\sqrt{5x})^3 - 1[(\sqrt{5x})^3]'}{[(\sqrt{5x})^3]^2} \right\}$$

DERIVADA TERCEIRA

$$y''' = -\frac{25}{4} \left\{ \frac{0.(\sqrt{5x})^3 - 1[[(5x)^{1/2}]^3]'}{(\sqrt{5x})^6} \right\}$$

$$y''' = -\frac{25}{4} \left\{ \frac{0 - 1[(5x)^{3/2}]'}{(\sqrt{5x})^6} \right\}$$

$$y''' = -\frac{25}{4} \left\{ \frac{-1[\frac{3}{2}(5x)^{3/2-1}(5x)']}{(\sqrt{5x})^6} \right\}$$

$$y''' = -\frac{25}{4} \left\{ \frac{-1[\frac{3}{2}(5x)^{1/2} . 5]}{(\sqrt{5x})^6} \right\}$$

$$y''' = -\frac{25}{4} \left\{ \frac{-\frac{15\sqrt{5x}}{2}}{(\sqrt{5x})^6} \right\}$$

$$y''' = -\frac{25}{4} \left\{ \frac{-15}{2} \cancel{\sqrt{5x}} . \frac{1}{(\sqrt{5x})^6} \right\}$$

$$y''' = -\frac{25}{4} \left\{ \frac{-15}{2} . \frac{1}{(\sqrt{5x})^5} \right\}$$

$$y''' = \frac{375}{8(\sqrt{5x})^5}$$

7) $y = \sqrt[3]{2x} \Rightarrow y = (2x)^{1/3}$ $\qquad (2x)^{1/3} = u^{\varnothing}$

$$y' = [(2x)^{1/3}]'$$

$$y' = \left[\frac{1}{3}(2x)^{1/3-1} . (2x)' \right]$$

$$y' = \left[\frac{1}{3}(2x)^{-2/3} . 2 \right]$$

$$y' = \frac{1}{3} . \frac{1}{2x^{2/3}} . 2$$

$$y' = \frac{2}{3} \frac{1}{\sqrt[3]{(2x)^2}}$$

$$y' = \frac{2}{3} \frac{1}{(\sqrt[3]{2x})^2}$$

DERIVADA PRIMEIRA

$$y'' = \left(\frac{2}{3}\,\frac{1}{(\sqrt[3]{2x})^2}\right)'$$

$$(2x)^{2/3} = u^{\emptyset}$$

$$y'' = \frac{2}{3}\left(\frac{1}{(\sqrt[3]{2x})^2}\right)'$$

DERIVADA SEGUNDA

$$y'' = \frac{2}{3}\left\{\frac{(1)'(\sqrt[3]{2x})^2 - 1[(\sqrt[3]{2x})^2]'}{[(\sqrt[3]{2x})^2]^2}\right\}$$

$$y'' = \frac{2}{3}\left\{\frac{0(\sqrt[3]{2x})^2 - 1[((2x)^{1/3})^2]'}{(\sqrt[3]{2x})^4}\right\}$$

$$y'' = \frac{2}{3}\left\{\frac{0 - 1[(2x)^{2/3}]'}{(\sqrt[3]{2x})^4}\right\}$$

$$y'' = \frac{2}{3}\left\{\frac{-1[\frac{2}{3}(2x)^{\frac{2}{3}-1}\cdot(2x)']}{(\sqrt[3]{2x})^4}\right\}$$

$$y'' = \frac{2}{3}\left\{\frac{-1(\frac{2}{3}(2x)^{-1/3}\cdot 2)}{(\sqrt[3]{2x})^4}\right\}$$

$$y'' = \frac{2}{3}\left\{\frac{-\frac{4}{3}\cdot\frac{1}{2x^{1/3}}}{(\sqrt[3]{2x})^4}\right\}$$

$$y'' = \frac{2}{3}\left(\frac{-\frac{4}{3}\cdot\frac{1}{\sqrt[3]{2x}}}{(\sqrt[3]{2x})^4}\right)$$

$$y'' = \frac{2}{3}\left(-\frac{4}{3}\cdot\frac{1}{\sqrt[3]{2x}}\;\frac{1}{(\sqrt[3]{2x})^4}\right)$$

$$y'' = \frac{2}{3}\cdot -\frac{4}{3(\sqrt[3]{2x})^5}$$

$$y'' = \frac{-8}{9}\;\frac{1}{(\sqrt[3]{2x})^5}$$

$$y''' = \left(\frac{-8}{9}\;\frac{1}{(\sqrt[3]{2x})^5}\right)'$$

DERIVADA TERCEIRA

$$y''' = -\frac{8}{9}\left(\frac{1}{(\sqrt[3]{2x})^5}\right)'$$

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$$y''' = -\frac{8}{9}\left\{\frac{(1)'(\sqrt[3]{2x})^5 - 1[(\sqrt[3]{2x})^5]'}{[(\sqrt[3]{2x})^5]^2}\right\}$$

$$2x^{5/3} = u^{d}$$

$$y''' = -\frac{8}{9}\left\{\frac{0(\sqrt[3]{2x})^5 - 1[((2x)^{1/3})^5]'}{(\sqrt[3]{2x})^{10}}\right\}$$

$$y''' = -\frac{8}{9}\left\{\frac{0 - 1[(2x)^{5/3}]'}{(\sqrt[3]{2x})^{10}}\right\}$$

$$y''' = -\frac{8}{9}\left\{\frac{-1[\frac{5}{3}(2x)^{5/3-1}\cdot(2x)']}{(\sqrt[3]{2x})^{10}}\right\}$$

$$y''' = -\frac{8}{9}\left\{\frac{-1[\frac{5}{3}(2x)^{2/3}\cdot 2]}{(\sqrt[3]{2x})^{10}}\right\}$$

$$y''' = -\frac{8}{9}\left\{\frac{-1[\frac{5}{3}(\sqrt[3]{2x})^2\cdot 2]}{(\sqrt[3]{2x})^{10}}\right\}$$

$$y''' = -\frac{8}{9}\left\{\frac{-1(\frac{10}{3}(\sqrt[3]{2x})^2)}{(\sqrt[3]{2x})^{10}}\right\}$$

$$y''' = -\frac{8}{9}\left\{\frac{-\frac{10}{3}(\sqrt[3]{2x})^2}{(\sqrt[3]{2x})^{10}}\right\}$$

$$y''' = -\frac{8}{9}\left(\frac{-10\cancel{(\sqrt[3]{2x})^2}}{3}\cdot\frac{1}{(\sqrt[3]{2x})^{\cancel{10}\,8}}\right)$$

$$y''' = -\frac{8}{9}\left(-\frac{10}{3}\cdot\frac{1}{(\sqrt[3]{2x})^8}\right)$$

$$y''' = \frac{80}{27}\cdot\frac{1}{(\sqrt[3]{2x})^8}$$

8) $y = e^{-x}$ $\qquad e^{-x} = e^{u}$

$y' = (e^{-x})'$
$y' = e^{-x}(-x)'$
$y' = e^{-x}(-1)$
$y' = -e^{-x}$

PRIMEIRA DERIVADA

$y'' = (-e^{-x})'$ $\qquad -e^{-x} = -1e^{-x}$

$y'' = (-1e^{-x})'$

$y'' = (-1)'e^{-x} + (-1)(e^{-x})'$ $\qquad e^{-x} = e^{u}$

$y'' = 0 . e^{-x} + (-1)[e^{-x} . (-x)']$

$y'' = 0 + (-1)[e^{-x}(-1)]$

$y'' = (-1)(-e^{-x})$

$y'' = e^{-x}$

DERIVADA SEGUNDA

$y''' = (e^{-x})'$ $\qquad e^{-x} = e^{u}$

$y''' = e^{-x}(-x)'$

$y''' = e^{-x}(-1)$

$y''' = -e^{-x}$

DERIVADA TERCEIRA

9 $y = \ln x$

$y' = (\ln x)'$

$y' = \dfrac{1}{x}$

DERIVADA PRIMEIRA

$y'' = \left(\dfrac{1}{x}\right)'$ $\qquad \dfrac{1}{x} = x^{-1}$

$y'' = (x^{-1})'$

$y'' = (-1x^{-1-1})$

$y'' = -x^{-2}$

$y'' = -\dfrac{1}{x^2}$

DERIVADA SEGUNDA

$y''' = \left(-\dfrac{1}{x^2}\right)'$ $\qquad -\dfrac{1}{x^2} = -x^{-2}$

$y''' = (-x^{-2})'$

DERIVADA TERCEIRA

$y''' = [-(-2x^{-2-1})]$

$y''' = [-(-2x^{-3})]$

$y''' = 2x^{-3}$

$y''' = \dfrac{2}{x^3}$

10) $y = 3^{2x}$

$y' = (3^{2x})'$ $\qquad 3^{2x} = a^u$ $\qquad$ DERIVADA PRIMEIRA

$y' = 3^{2x} \ln 3 \, (2x)'$

$y' = 3^{2x} \ln 3 \cdot 2$

$y' = 3^{2x} \, 2 \ln 3$

$y'' = (3^{2x} \, 2 \ln 3)'$ $\qquad 3^{2x} = a^u$ $\qquad$ DERIVADA SEGUNDA

$y'' = (3^{2x})' \, 2\ln 3 + 3^{2x} (2 \ln 3)'$

$y'' = 3^{2x} \ln 3 \, (2x)' (2 \ln 3) + 3^{2x} \cdot 0$

$y'' = 3^{2x} \ln 3 \cdot 2 \, (2 \ln 3) + 0$

$y'' = 3^{2x} \, 2 \ln 3 \cdot 2 \ln 3$

$y'' = 3^{2x} (2 \ln 3)^2$

$y''' = [3^{2x} (2 \ln 3)^2]'$ $\qquad 3^{2x} = a^u$ $\qquad$ DERIVADA TERCEIRA

$y''' = (3^{2x})' (2 \ln 3)^2 + 3^{2x} [(2 \ln 3)^2]'$

$y''' = 3^{2x} \ln 3 \, (2x)' (2 \ln 3)^2 + 3^{2x} \cdot 0$

$y''' = 3^{2x} \ln 3 \cdot 2 \, (2 \ln 3)^2 + 0$

$y''' = 3^{2x} \, 2 \ln 3 \, (2 \ln 3)^2$

$y''' = 3^{2x} (2 \ln 3)^3$

11) $y = (x+1)^4$

$y' = [(x+1)^4]'$ $\qquad (x+1)^4 = u^n$

$y' = 4(x+1)^{4-1} \cdot (x+1)'$

$y' = 4(x+1)^3 \cdot [(x)' + (1)']$

$y' = 4(x+1)^3 [1+0]$

$y' = 4(x+1)^3 (1)$

$y' = 4(x+1)^3$

DERIVADA PRIMEIRA

$y'' = [4(x+1)^3]'$ $\qquad (x+1)^3 = u^\alpha$

$y'' = 4[(x+1)^3]'$

$y'' = 4\{3(x+1)^{3-1}(x+1)'\}$

$y'' = 4\{3(x+1)^2 [(x)' + (1)']\}$

$y'' = 4\{3(x+1)^2 [1+0]\}$

$y'' = 4\{3(x+1)^2 (1)\}$

$y'' = 4\{3(x+1)^2\}$

$y'' = 12(x+1)^2$

DERIVADA SEGUNDA

$y''' = [12(x+1)^2]'$ $\qquad (x+1)^2 = u^\alpha$

$y''' = 12[(x+1)^2]'$

$y''' = 12\{2(x+1)^{2-1}(x+1)'\}$

$y''' = 12\{2(x+1)^1 [(x)' + (1)']\}$

$y''' = 12\{2(x+1)[1+0]\}$

$y''' = 12\{2(x+1)(1)\}$

$y''' = 12\{2(x+1)\}$

$y''' = 24(x+1)$

$y''' = 24x + 24$

DERIVADA TERCEIRA

(12) $y = x \ln x$

$y' = (x \ln x)'$

$y' = (x)' \ln x + x (\ln x)'$

$y' = 1 \ln x + x \cdot \frac{1}{x}$, $\rightarrow y' = \ln x + 1$

DERIVADA PRIMEIRA

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$y'' = (\ln x + 1)'$

$y'' = (\ln x)' + (1)'$

$y'' = \frac{1}{x} + 0$

$y'' = \frac{1}{x}$

DERIVADA SEGUNDA

$y''' = \left(\frac{1}{x}\right)'$ $\qquad \frac{1}{x} = x^{-1}$

$y''' = (x^{-1})'$

$y''' = (-1x^{-1-1})$

$y''' = -x^{-2}$

$y''' = -\frac{1}{x^2}$

DERIVADA TERCEIRA

13 $y = e^{-x^2}$ $\qquad e^{-x^2} = e^u$

$y' = (e^{-x^2})'$

$y' = e^{-x^2}(-x^2)'$

$y' = e^{-x^2}(-2x^{2-1})$

$y' = e^{-x^2}(-2x) = -2x\, e^{-x^2}$

DERIVADA PRIMEIRA

$y'' = [e^{-x^2}(-2x)]'$ $\qquad e^{-x^2} = e^u$

$y'' = (e^{-x^2})'(-2x) + e^{-x^2}(-2x)'$

$y'' = e^{-x^2}(-x^2)'(-2x) + e^{-x^2}(-2)$

$y'' = e^{-x^2}(-2x^{2-1})(-2x) - 2e^{-x^2}$

$y'' = e^{-x^2}(-2x)(-2x) - 2e^{-x^2}$

$y'' = e^{-x^2}(4x^2) - 2e^{-x^2}$

$y'' = e^{-x^2}(4x^2 - 2)$

DERIVADA SEGUNDA

$y''' = [e^{-x^2}(4x^2-2)]'$ $\qquad e^{-x^2} = e^{u}$

$y''' = (e^{-x^2})'(4x^2-2) + e^{-x^2}(4x^2-2)'$

$y''' = e^{-x^2}(-x^2)'(4x^2-2) + e^{-x^2}[(4x^2)' - (2)']$

$y''' = e^{-x^2}(-2x^{2-1})(4x^2-2) + e^{-x^2}[4(x^2)' - 0]$

$y''' = e^{-x^2}(-2x)(4x^2-2) + e^{-x^2}[4(2x^{2-1})]$

$y''' = e^{-x^2}(-8x^3+4x) + e^{-x^2}[4(2x)]$

$y''' = e^{-x^2}(-8x^3+4x) + e^{-x^2}(8x)$

$y''' = e^{-x^2}(-8x^3+4x+8x)$

$y''' = e^{-x^2}(-8x^3+12x)$

DERIVADA TERCEIRA

14) $y = 0{,}4x^{0{,}1}$

$y' = (0{,}4x^{0{,}1})'$

$y' = 0{,}4(x^{0{,}1})'$

$y' = 0{,}4(0{,}1x^{0{,}1-1})$

$y' = 0{,}4(0{,}1x^{-0{,}9})$

$y' = 0{,}04x^{-0{,}9}$

DERIVADA PRIMEIRA

$y'' = (0{,}04x^{-0{,}9})'$

$y'' = 0{,}04(x^{-0{,}9})'$

$y'' = 0{,}04(-0{,}9x^{-0{,}9-1})$

$y'' = 0{,}04(-0{,}9x^{-1{,}9})$

$y'' = -0{,}036x^{-1{,}9}$

DERIVADA SEGUNDA

$y''' = (-0{,}036x^{-1{,}9})'$

$y''' = -0{,}036(x^{-1{,}9})'$

$y''' = -0{,}036(-1{,}9x^{-1{,}9-1})$

$y''' = -0{,}036(-1{,}9x^{-2{,}9})$

$y''' = 0{,}0684x^{-2{,}9}$

DERIVADA TERCEIRA

13 $y = (1-x)^3$

$(1-x)^3 = u^\alpha$

$y' = [(1-x)^3]'$
$y' = 3(1-x)^{3-1}(1-x)'$
$y' = 3(1-x)^2[(1)' - (x)']$
$y' = 3(1-x)^2[0-1]$
$y' = 3(1-x)^2(-1)$
$y' = -3(1-x)^2$

DERIVADA PRIMEIRA

$(1-x)^2 = u^\alpha$

$y'' = [-3(1-x)^2]'$
$y'' = -3[(1-x)^2]'$
$y'' = -3[2(1-x)^{2-1}(1-x)']$
$y'' = -3\{2(1-x)[(1)' - (x)']\}$
$y'' = -3\{2(1-x)[0-1]\}$
$y'' = -3\{2(1-x)(-1)\}$
$y'' = -3\{-2(1-x)\}$
$y'' = 6(1-x) = 6 - 6x$

DERIVADA SEGUNDA

$y''' = (6-6x)'$
$y''' = (6)' - (6x)'$
$y''' = 0 - 6(x)'$
$y''' = -6(1)$
$y''' = -6$

DERIVADA TERCEIRA

16 $y = -\dfrac{1}{2}x^{-2}$

$y' = \left(-\dfrac{1}{2}x^{-2}\right)'$

$y' = -\dfrac{1}{2}(x^{-2})'$

$y' = -\dfrac{1}{2}(-2x^{-2-1})$

$y' = -\dfrac{1}{2}(-\cancel{2}x^{-3})$

$y' = -1(-x^{-3})$

$y' = x^{-3}$

$y'' = (x^{-3})'$

$y'' = (-3x^{-3-1})$

$y'' = -3x^{-4}$

$y''' = (-3x^{-4})'$

$y''' = -3(x^{-4})'$

$y''' = -3(-4x^{-4-1})$

$y''' = -3(-4x^{-5})$

$y''' = 12x^{-5}$

17 $y = e^{1/x}$

$e^{1/x} = e^{u}$

$y' = (e^{1/x})'$

$y' = e^{1/x}\left(\frac{1}{x}\right)'$

DERIVADA PRIMEIRA

$y' = e^{1/x}(x^{-1})'$

$y' = e^{1/x}(-1x^{-1-1})$

$y' = e^{1/x}(-x^{-2})$

$y' = e^{1/x} \cdot \frac{-1}{x^2}$

$y' = \frac{-1}{x^2} e^{1/x}$

$y'' = \left(-\frac{1}{x^2} \cdot e^{1/x}\right)'$

$e^{1/x} = e^{u}$

$y'' = \left(\frac{-1}{x^2}\right)' e^{1/x} + \left(\frac{-1}{x^2}\right)(e^{1/x})'$

DERIVADA SEGUNDA

$y'' = (-x^{-2})' e^{1/x} + \left(\frac{-1}{x^2}\right) e^{1/x} \left(\frac{1}{x}\right)'$

$y'' = [-2(-x^{-2-1})] e^{1/x} + \left(\frac{-1}{x^2}\right) e^{1/x} (x^{-1})'$

$y'' = 2x^{-3} \cdot e^{1/x} + \left(\frac{-1}{x^2}\right) e^{1/x} (-1x^{-1-1})$

$y'' = \frac{1}{2x^3} e^{1/x} + \left(\frac{-1}{x^2}\right) e^{1/x} (-x^{-2})$

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$y'' = \frac{1}{2x^3} e^{1/x} + \left(\frac{-1}{x^2}\right) e^{1/x} \left(\frac{-1}{x^2}\right)$

$y'' = \frac{1}{2x^3} e^{1/x} + \frac{1}{x^4} e^{1/x}$

$y'' = 2x^{-3} e^{1/x} + x^{-4} e^{1/x}$

$y'' = e^{1/x}(2x^{-3} + x^{-4})$

$y''' = [e^{1/x}(2x^{-3}+x^{-4})]'$ $\qquad e^{u} = e^{1/x}$

$y''' = (e^{1/x})'(2x^{-3}+x^{-4}) + e^{1/x}(2x^{-3}+x^{-4})'$

$y''' = e^{1/x}\left(\frac{1}{x}\right)'(2x^{-3}+x^{-4}) + e^{1/x}[(2x^{-3})' + (x^{-4})']$

DERIVADA TERCEIRA

$y''' = e^{1/x}(x^{-1})'(2x^{-3}+x^{-4}) + e^{1/x}[2(x^{-3})' + (-4x^{-4-1})]$

$y''' = e^{1/x}(-1x^{-1-1})(2x^{-3}+x^{-4}) + e^{1/x}[2(-3x^{-3-1}) + (-4x^{-5})]$

$y''' = e^{1/x}(-x^{-2})(2x^{-3}+x^{-4}) + e^{1/x}[2(-3x^{-4}) - 4x^{-5}]$

$y''' = e^{1/x}(-2x^{-5} - x^{-6}) + e^{1/x}(-6x^{-4} - 4x^{-5})$

$y''' = e^{1/x}(-2x^{-5} - x^{-6} - 6x^{-4} - 4x^{-5})$

$y''' = e^{1/x}(-6x^{-5} - x^{-6} - 6x^{-4})$

18 $y = xe^{-2x}$ $\qquad e^{-2x} = e^{u}$

$y' = (xe^{-2x})'$

$y' = (x)'e^{-2x} + x(e^{-2x})$

$y' = 1e^{-2x} + xe^{-2x}(-2x)'$

$y' = e^{-2x} + xe^{-2x}(-2)$

$y' = e^{-2x} - 2xe^{-2x}$

$y' = e^{-2x}(1-2x)$

DERIVADA PRIMEIRA

$y'' = [e^{-2x}(1-2x)]'$ $\qquad e^{-2x} = e^{u}$

$y'' = (e^{-2x})'(1-2x) + e^{-2x}(1-2x)'$

$y'' = e^{-2x}(-2x)'(1-2x) + e^{-2x}[(1)' - (2x)']$

$y'' = e^{-2x}(-2)(1-2x) + e^{-2x}[0-2]$

$y'' = e^{-2x}(-2+4x) + e^{-2x}(-2)$

$y'' = e^{-2x}(-2+4x-2)$

$y'' = e^{-2x}(-4+4x)$

DERIVADA SEGUNDA

$y''' = [e^{-2x}(-4+4x)]'$

$e^{-2x} = e^{u}$

$y''' = (e^{-2x})'(-4+4x) + e^{-2x}(-4+4x)'$

$y''' = e^{-2x}(-2x)'(-4+4x) + e^{-2x}[(-4)' + (4x)']$

$y''' = e^{-2x}(-2)(-4+4x) + e^{-2x}[0+4]$

$y''' = e^{-2x}(8-8x) + e^{-2x}(4)$

$y''' = e^{-2x}(8-8x+4)$

$y''' = e^{-2x}(12-8x)$

DERIVADA TERCEIRA

19 $y = 1-x^3$

$y' = (1-x^3)'$

$y' = (1)' - (x^3)'$

$y' = 0 - (3x^{3-1})$

$y' = -3x^2$

$y'' = (-3x^2)'$

$y'' = -3(x^2)'$

$y'' = -3(2x^{2-1})$

$y'' = -3(2x)$

$y'' = -6x$

$y''' = (-6x)'$

$y''' = -6$

20 $y = \log(-x)$

$\log(-x) = \dfrac{\ln(-x)}{\ln 10}$

$y' = \left(\dfrac{\ln(-x)}{\ln 10}\right)'$

$y' = \dfrac{(\ln(-x))'(\ln 10) - \ln(-x)(\ln 10)'}{(\ln 10)^2}$

$y' = \dfrac{(\ln(-x))'(\ln 10) - \ln(-x) \cdot 0}{(\ln 10)^2}$

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$$y' = \frac{(\ln(-x))'(\ln 10) - 0}{(\ln 10)^2}$$

$$y' = \frac{(\ln(-x))'\cancel{(\ln 10)}}{(\ln 10)^2}$$

$$y' = \frac{(\ln(-x))'}{\ln 10}$$

$$y' = \frac{(\ln(-1.x))'}{\ln 10}$$

$$y' = \frac{(\ln -1 + \ln x)'}{\ln 10}$$

$$y' = \frac{[(\ln -1)' + (\ln x)']}{\ln 10}$$

$$y' = \frac{[0 + 1/x]}{\ln 10}$$

$$y' = \frac{1/x}{\ln 10}$$

$$y' = \frac{1}{x} \cdot \frac{1}{\ln 10}$$

DERIVADA PRIMEIRA

$$y'' = \left(\frac{1}{x} \frac{1}{\ln 10}\right)'$$

$$y'' = \left(\frac{1}{x}\right)' \frac{1}{\ln 10} + \frac{1}{x}\left(\frac{1}{\ln 10}\right)'$$

$$y'' = (x^{-1})' \frac{1}{\ln 10} + \frac{1}{x} \cdot 0$$

$$y'' = (-1x^{-1-1}) \frac{1}{\ln 10} + 0$$

$$y'' = (-x^{-2}) \frac{1}{\ln 10}$$

$$y'' = -\frac{1}{x^2} \frac{1}{\ln 10}$$

DERIVADA SEGUNDA

$$y''' = \left(-\frac{1}{x^2} \cdot \frac{1}{\ln 10}\right)'$$

$$y''' = \left(-\frac{1}{x^2}\right)' \frac{1}{\ln 10} + -\frac{1}{x^2}\left(\frac{1}{\ln 10}\right)'$$

$$y''' = (-x^{-2})' \frac{1}{\ln 10} + -\frac{1}{x^2} \cdot 0$$

DERIVADA TERCEIRA

$$y''' = \left(-2\left(-x^{-2-1}\right)\right)\frac{1}{\ln 10} + 0$$

$$y''' = 2x^{-3}\frac{1}{\ln 10}$$

$$y''' = 2\cdot\frac{1}{x^3}\cdot\frac{1}{\ln 10}$$

$$y''' = \frac{2}{\ln 10}\cdot\frac{1}{x^3}$$