

# EJERCICIOS 1, 2

$$1) \lim_{x \rightarrow 0} \frac{2x - 7}{3x + 11} = \frac{2(0) - 7}{3(0) + 11} = -\frac{7}{11}$$

$$2) \lim_{x \rightarrow 2} \sqrt{4x^2 + 9} = \sqrt{4(2)^2 + 9} = \sqrt{16 + 9} = \sqrt{25} = 5$$

$$3) \lim_{x \rightarrow 6} \sqrt{x^2 + 67} = \sqrt{(6)^2 + 67} = \sqrt{36 + 67} = \sqrt{103}$$

$$4) \lim_{x \rightarrow 11} \frac{\sqrt{x-2}}{x-1} = \frac{\sqrt{11-2}}{11-1} = \frac{\sqrt{9}}{10} = \frac{3}{10}$$

$$\begin{aligned} 5) \lim_{x \rightarrow -5} (2x^3 + 9x^2) &= 2(-5)^3 + 9(-5)^2 \\ &= 2(-125) + 9(25) \\ &= -250 + 225 \\ &= -25 \end{aligned}$$

$$\begin{aligned} 6) \lim_{x \rightarrow 3} \frac{1}{\sqrt[3]{x^2 - 1}} &= \frac{1}{\sqrt[3]{(3)^2 - 1}} \\ &= \frac{1}{\sqrt[3]{9 - 1}} = \frac{1}{\sqrt[3]{8}} = \frac{1}{2} \end{aligned}$$

$$\begin{aligned} 7) \lim_{x \rightarrow -1} (x^2 - 7x - 13) &= (-1)^2 - 7(-1) - 13 \\ &= 1 + 7 - 13 \\ &= -5 \end{aligned}$$

$$\begin{aligned} 8) \lim_{x \rightarrow 12} \sqrt{5x + 4} &= \sqrt{5(12) + 4} = \sqrt{60 + 4} \\ &= \sqrt{64} = 8 \end{aligned}$$

$$\begin{aligned} 9) \lim_{x \rightarrow 8} \frac{5x + 2}{\sqrt{x + 1}} &= \frac{5(8) + 2}{\sqrt{8 + 1}} = \frac{42}{\sqrt{9}} \\ &= \frac{42}{3} = 14 \end{aligned}$$

$$\textcircled{10} \lim_{x \rightarrow -6} \frac{\sqrt{x^2 - 35}}{\sqrt[3]{x - 2}} = \frac{\sqrt{(-6)^2 - 35}}{\sqrt[3]{(-6) - 2}} = \frac{\sqrt{36 - 35}}{\sqrt[3]{-8}} = -\frac{1}{2}$$

$\textcircled{10.}$

Taller 1.3

$$\lim_{x \rightarrow 1} \frac{x^2 + 4x - 5}{x^2 + 5x - 6}$$

$$= \lim_{x \rightarrow 1} \frac{x^2 + 4x - 5}{x^2 + 5x - 6} = \frac{(1)^2 + 4(1) - 5}{(1)^2 + 5(1) - 6} = \frac{0}{0} //$$

$$\lim_{x \rightarrow 1} \frac{x^2 + 4x - 5}{x^2 + 5x - 6}$$

$$\lim_{x \rightarrow 1} \frac{x^2 + 5x - x - 5}{x^2 + 6x - x - 6}$$

$$\lim_{x \rightarrow 1} \frac{x(x+5) - (x+5)}{x(x+6) - (x+6)}$$

$$\lim_{x \rightarrow 1} \frac{(x+5)(\cancel{x-1})}{(x+6)(\cancel{x-1})}$$

$$\lim_{x \rightarrow 1} \frac{x+5}{x+6} = \frac{1+5}{1+6} = \frac{6}{7} //$$



②

$$\lim_{x \rightarrow -1} \frac{x^2 - x - 2}{x^2 + 4x + 3}$$

$$\lim_{x \rightarrow -1} \frac{x^2 - x - 2}{x^2 + 4x + 3} = \frac{(-1)^2 - (-1) - 2}{(-1)^2 + 4(-1) + 3} = \frac{1 + 1 - 2}{1 + 3 - 4} = \frac{0}{0}$$

$$\lim_{x \rightarrow -1} \frac{x^2 - x - 2}{x^2 + 4x + 3}$$

$$\lim_{x \rightarrow -1} \frac{x^2 + x - 2}{x^2 + 3x + x + 3}$$

$$\lim_{x \rightarrow -1} \frac{x(x+1) - 2(x+1)}{x(x+3) + x + 3}$$

$$\lim_{x \rightarrow -1} \frac{(x+1)(x-2)}{(x+3)(x+1)}$$

$$\lim_{x \rightarrow -1} \frac{x-2}{x+3} = \frac{(-1) - 2}{(-1) + 3} = -\frac{3}{2}$$

③

$$\lim_{x \rightarrow 2} \frac{2x^2 - 8}{x^3 - 8}$$

$$\lim_{x \rightarrow 2} \frac{2x^2 - 8}{x^3 - 8} = \frac{2(2)^2 - 8}{(2)^3 - 8} = \frac{0}{0}$$

$$\lim_{x \rightarrow 2} \frac{2x^2 - 8}{x^3 - 8}$$

$$\lim_{x \rightarrow 2} \frac{2(x^2 - 4)}{(x-2)(x^2 + 2x + 4)}$$

$$\lim_{x \rightarrow 2} \frac{2(x-2)(x+2)}{(x-2)(x^2 + 2x + 4)}$$

$$\lim_{x \rightarrow 2} \frac{2(x+2)}{x^2 + 2x + 4}$$



$$\lim_{x \rightarrow 2} \frac{2x+4}{x^2+2x+4} = \frac{2(2)+4}{(2)^2+2(2)+4} = \frac{8}{12} = \frac{2}{3} //$$

④  $\lim_{x \rightarrow 5} \frac{x^2 - 5x}{x^2 + 5x - 50}$

$$\lim_{x \rightarrow 5} \frac{x^2 - 5x}{x^2 + 5x - 50} = \frac{(5)^2 - 5(5)}{(5)^2 + 5(5) - 50} = \frac{0}{0} //$$

$$\lim_{x \rightarrow 5} \frac{x^2 - 5x}{x^2 + 5x - 50}$$

$$\lim_{x \rightarrow 5} \frac{x(x-5)}{x^2 + 10x - 5x - 50}$$

$$\lim_{x \rightarrow 5} \frac{x(x-5)}{x(x+10) - 5(x+10)}$$

$$\lim_{x \rightarrow 5} \frac{x(\cancel{x-5})}{(x+10)(\cancel{x-5})}$$

$$\lim_{x \rightarrow 5} \frac{x}{x+10} = \frac{5}{5+10} = \frac{5}{15} = \frac{1}{3} //$$

⑤  $\lim_{x \rightarrow -3} \frac{x^3 + x^2 - 10x - 12}{6x^2 + 13x - 15}$

$$\lim_{x \rightarrow -3} \frac{x^3 + x^2 - 10x - 12}{6x^2 + 13x - 15} = \frac{(-3)^3 + (-3)^2 - 10(-3) - 12}{6(-3)^2 + 13(-3) - 15} = \frac{0}{0} //$$

$$\lim_{x \rightarrow -3} \frac{x^3 + x^2 - 10x - 12}{6x^2 + 13x - 15}$$

$$\lim_{x \rightarrow -3} \frac{x^3 + 3x^2 - 2x^2 - 6x - 4x - 12}{6x^2 + 18x - 5x - 15}$$

$$\lim_{x \rightarrow -3} \frac{x^2(x+3) - 2x(x+3) - 4(x+3)}{6x(x+3) - 5(x+3)}$$

$$\lim_{x \rightarrow -3} \frac{(x+3)(x^2-2x-4)}{(x+3)(6x-5)}$$

$$\lim_{x \rightarrow -3} \frac{x^2-2x-4}{6x-5} = \frac{(-3)^2 - 2(-3) - 4}{6(-3) - 5} = \frac{9+6-4}{-18-5}$$

$$= \frac{11}{-23} //$$

$$\textcircled{6} \lim_{x \rightarrow 3} \frac{x^3 + x - 30}{x^3 - x^2 - 18}$$

$$\lim_{x \rightarrow 3} \frac{x^3 + x - 30}{x^3 - x^2 - 18} = \frac{(3)^3 + 3 - 30}{(3)^3 - (3)^2 - 18} = \frac{27+3-30}{27-9-18} = \frac{0}{0} //$$

$$\lim_{x \rightarrow 3} \frac{x^3 + x - 30}{x^3 - x^2 - 18}$$

$$\lim_{x \rightarrow 3} \frac{x^3 - 9x + 10x - 30}{x^3 - 3x^2 + 2x^2 - 18}$$

$$\lim_{x \rightarrow 3} \frac{x(x^2-9)+10(x-3)}{x^2(x-3)+2(x^2-9)}$$

$$\lim_{x \rightarrow 3} \frac{x(x-3)(x+3)+10(x-3)}{x^2(x-3)+2(x-3)(x+3)}$$

$$\lim_{x \rightarrow 3} \frac{(x-3)(x(x+3)+10)}{(x-3)(x^2+2(x+3))}$$

$$\lim_{x \rightarrow 3} \frac{(x-3)(x^2+3x+10)}{(x-3)(x^2+2x+6)}$$

$$\lim_{x \rightarrow 3} \frac{x^2+3x+10}{x^2+2x+6} = \frac{(3)^2 + 3(3) + 10}{(3)^2 + 2(3) + 6} = \frac{28}{21} = \frac{4}{3} //$$



$$\textcircled{7} \lim_{x \rightarrow -5} \frac{7x^2 + 9x - 130}{6x^2 + 9x - 105}$$

$$\lim_{x \rightarrow -5} \frac{7x^2 + 9x - 130}{6x^2 + 9x - 105} = \frac{7(-5)^2 + 9(-5) - 130}{6(-5)^2 + 9(-5) - 105} = \frac{175 - 45 - 130}{150 + 45 - 105} = \frac{0}{0} //$$

$$\lim_{x \rightarrow -5} \frac{7x^2 + 9x - 130}{6x^2 + 9x - 105}$$

$$05 - x + 8x$$

$$m: 1$$

$$8x - 5x - 6x$$

$$8x - x$$

$$\lim_{x \rightarrow -5} \frac{7x^2 + 35x - 26x - 130}{3(2x^2 + 3x - 35)}$$

$$\lim_{x \rightarrow -5} \frac{7x(x+5) - 26(x+5)}{3(2x^2 + 10x - 7x - 35)}$$

$$\lim_{x \rightarrow -5} \frac{(x+5)(7x-26)}{3(2x(x+5) - 7(x+5))}$$

$$\lim_{x \rightarrow -5} \frac{(x+5)(7x-26)}{3(x+5)(2x-7)}$$

$$\lim_{x \rightarrow -5} \frac{7x-26}{3(2x-7)}$$

$$\lim_{x \rightarrow -5} \frac{7x-26}{6x-21} = \frac{7(-5)-26}{6(-5)-21} = \frac{61}{51} //$$

$$\textcircled{8} \lim_{x \rightarrow 8} \frac{5x^2 - 8x - 256}{x^2 - 64}$$

$$\lim_{x \rightarrow 8} \frac{5x^2 - 8x - 256}{x^2 - 64} = \frac{5(8)^2 - 8(8) - 256}{8^2 - 64} = \frac{320 - 64 - 256}{64 - 64} = \frac{0}{0} //$$

$$= \frac{0}{0} //$$



$$\lim_{x \rightarrow 8} \frac{5x^2 - 8x - 256}{x^2 - 64}$$

$$\lim_{x \rightarrow 8} \frac{5x^2 + 32x - 40x - 256}{(x-8)(x+8)}$$

$$\lim_{x \rightarrow 8} \frac{x(5x+32) - 8(5x+32)}{(x-8)(x+8)}$$

$$\lim_{x \rightarrow 8} \frac{(5x+32)(\cancel{x-8})}{(\cancel{x-8})(x+8)}$$

$$\lim_{x \rightarrow 8} \frac{5x+32}{x+8} = \frac{5(8)+32}{8+8} = \frac{40+32}{16} = \frac{72}{16} = \frac{9}{2} //$$

⑨  $\lim_{x \rightarrow 2} \frac{x^3 - 8}{x^2 + 3x - 10}$

$$\lim_{x \rightarrow 2} \frac{x^3 - 8}{x^2 + 3x - 10} = \frac{(2)^3 - 8}{(2)^2 + 3(2) - 10} = \frac{0}{0} //$$

$$\lim_{x \rightarrow 2} \frac{x^3 - 8}{x^2 + 3x - 10}$$

$$\lim_{x \rightarrow 2} \frac{(x-2)(x^2 + 2x + 4)}{x^2 + 5x - 2x - 10}$$

$$\lim_{x \rightarrow 2} \frac{(x-2)(x^2 + 2x + 4)}{x(x+5) - 2(x+5)}$$

$$\lim_{x \rightarrow 2} \frac{(\cancel{x-2})(x^2 + 2x + 4)}{(x+5)(\cancel{x-2})}$$

$$\lim_{x \rightarrow 2} \frac{x^2 + 2x + 4}{x+5} = \frac{(2)^2 + 2(2) + 4}{(2) + 5} = \frac{12}{7} //$$

$$(10) \quad \lim_{x \rightarrow 0} \frac{x^4 - x^3}{x^3 - x^2}$$

$$\lim_{x \rightarrow 0} \frac{x^4 - x^3}{x^3 - x^2} = \frac{(0)^4 - (0)^3}{(0)^3 - (0)^2} = \frac{0}{0} //$$

$$\lim_{x \rightarrow 0} \frac{x^4 - x^3}{x^3 - x^2}$$

$$\lim_{x \rightarrow 0} \frac{x^3 (x-1)}{x^2 (x-1)}$$

$$\lim_{x \rightarrow 0} \frac{x^3}{x^2}$$

$$\lim_{x \rightarrow 0} x = 0 //$$

$$(11) \quad \lim_{x \rightarrow 1} \frac{x^3 + x^2 - 5x + 3}{x^3 + 2x^2 - 7x + 4}$$

$$\lim_{x \rightarrow 1} \frac{x^3 + x^2 - 5x + 3}{x^3 + 2x^2 - 7x + 4} = \frac{(1)^3 + (1)^2 - 5(1) + 3}{(1)^3 + 2(1)^2 - 7(1) + 4} = \frac{0}{0} //$$

$$\lim_{x \rightarrow 1} \frac{x^3 - x^2 + 2x^2 - 2x - 3x + 3}{x^3 - x^2 + 3x^2 - 3x - 4x + 4}$$

$$\lim_{x \rightarrow 1} \frac{x^2(x-1) + 2x(x-1) - 3(x-1)}{x^2(x-1) + 3x(x-1) - 4(x-1)}$$

$$\lim_{x \rightarrow 1} \frac{(x-1)(x^2 + 2x - 3)}{(x-1)(x^2 + 3x - 4)}$$

$$\lim_{x \rightarrow 1} \frac{(x-1)(x^2 + 3x - x - 3)}{(x-1)(x^2 + 4x - x - 4)}$$



$$\lim_{x \rightarrow 1} \frac{x^2 + 3x - x - 3}{x^2 + 4x - x - 4}$$

$$\lim_{x \rightarrow 1} \frac{x(x+3) - (x+3)}{x(x+4) - (x+4)}$$

$$\lim_{x \rightarrow 1} \frac{(x+3)(x-1)}{(x+4)(x-1)}$$

$$\lim_{x \rightarrow 1} \frac{x+3}{x+4} = \frac{1+3}{1+4} = \frac{4}{5} //$$

12)  $\lim_{x \rightarrow 1} \frac{x^3 - 5x^2 + 8x - 4}{x^3 - 6x^2 + 12x - 7}$

$$\begin{array}{r} x^3 - 6x^2 + 12x - 7 \quad | \quad x-1 \\ \underline{x^3 + x^2} \phantom{+ 12x - 7} \\ -5x^2 + 12x \phantom{- 7} \\ \underline{+5x^2 - 5x} \phantom{- 7} \\ 7x - 7 \\ \underline{-7x + 7} \\ 0 \quad 0 // \end{array}$$

$$\begin{array}{r} x^3 - 5x^2 + 8x - 4 \quad | \quad x-1 \\ \underline{x^3 + x^2} \phantom{+ 8x - 4} \\ -4x^2 + 8x \phantom{- 4} \\ \underline{+4x^2 - 4x} \phantom{- 4} \\ 4x - 4 \\ \underline{-4x + 4} \\ 0 \quad 0 \end{array}$$

$$\lim_{x \rightarrow 1} \frac{x^3 - 5x^2 + 8x - 4}{x^3 - 6x^2 + 12x - 7} = \frac{(1)^3 - 5(1)^2 + 8(1) - 4}{(1)^3 - 6(1)^2 + 12(1) - 7} = \frac{1 - 5 + 8 - 4}{1 - 6 + 12 - 7} = \frac{0}{0} \text{ IND}$$

$$\lim_{x \rightarrow 1} \frac{(x-1)(x^2 - 4x + 4)}{(x-1)(x^2 - 5x + 7)}$$

$$\lim_{x \rightarrow 1} \frac{x^2 - 4x + 4}{x^2 - 5x + 7} = \frac{(1)^2 - 4(1) + 4}{(1)^2 - 5(1) + 7} = \frac{1 - 4 + 4}{1 - 5 + 7} = \frac{1}{3} //$$

13)  $\lim_{x \rightarrow 2} \frac{3x^2 + x - 14}{x^2 - x + 2}$

$$\lim_{x \rightarrow 2} \frac{3x^2 + x - 14}{x^2 - x + 2} = \frac{3(2)^2 + 2 - 14}{(2)^2 - 2 + 2} = \frac{0}{4} //$$



$$(14) \quad \lim_{x \rightarrow 3} \frac{x^2 - 5x - 6}{x - 3} = \frac{9 - 5(3) - 6}{3 - 3} = \frac{12}{0} //$$

(NO EXISTE)

$$(15) \quad \lim_{x \rightarrow 4} \frac{3x - 12}{5x - 20}$$

$$\lim_{x \rightarrow 4} \frac{3x - 12}{5x - 20} = \frac{3(4) - 12}{5(4) - 20} = \frac{0}{0} //$$

$$\lim_{x \rightarrow 4} \frac{3x - 12}{5x - 20}$$

$$\lim_{x \rightarrow 4} \frac{3(x - 4)}{5(x - 4)}$$

$$\lim_{x \rightarrow 4} \frac{3}{5} //$$

$$(16) \quad \lim_{x \rightarrow 5} \frac{x^2 - 11x + 30}{x - 5}$$

$$\lim_{x \rightarrow 5} \frac{x^2 - 11x + 30}{x - 5} = \frac{(5)^2 - 11(5) + 30}{5 - 5} = \frac{0}{0}$$

$$\lim_{x \rightarrow 5} \frac{x^2 - 11x + 30}{x - 5}$$

$$\lim_{x \rightarrow 5} \frac{x^2 - 5x - 6x + 30}{x - 5}$$

$$\lim_{x \rightarrow 5} \frac{x(x - 5) - 6(x - 5)}{x - 5}$$

$$\lim_{x \rightarrow 5} \frac{(x - 5)(x - 6)}{x - 5}$$

$$\lim_{x \rightarrow 5} (x - 6) = 5 - 6 = -1 //$$



# Incrementos

$$d(2ab + b^2)$$

20.)

$$y = x^2 - 7x + 9$$

$$y + \Delta y = (x + \Delta x)^2 - 7(x + \Delta x) + 9$$

$$\Delta y = (x + \Delta x)^2 - 7(x + \Delta x) + 9 - y$$

$$\Delta y = (x + \Delta x)^2 - 7(x + \Delta x) + 9 - (x^2 - 7x + 9)$$

$$\Delta y = (x^2 + 2x\Delta x + \Delta x^2) - 7x - 7\Delta x + 9 - x^2 + 7x - 9$$

$$\Delta y = \cancel{x^2} + 2x\Delta x + \Delta x^2 - \cancel{7x} - 7\Delta x + \cancel{9} - \cancel{x^2} + \cancel{7x} - \cancel{9}$$

$$\Delta y = 2x\Delta x + \Delta x^2 - 7\Delta x //$$

4.)

$$y = 3x - 7x^2$$

$$y + \Delta y = 3(x + \Delta x) - 7(x + \Delta x)^2$$

$$\Delta y = 3(x + \Delta x) - 7(x + \Delta x)^2 - y$$

$$\Delta y = 3(x + \Delta x) - 7(x + \Delta x)^2 - (3x - 7x^2)$$

$$\Delta y = 3x + 3\Delta x - 7(x^2 + 2x\Delta x + \Delta x^2) - 3x + 7x^2$$

$$\Delta y = \cancel{3x} + 3\Delta x - \cancel{7x^2} - 14x\Delta x - 7\Delta x^2 - \cancel{3x} + \cancel{7x^2}$$

$$\Delta y = 3\Delta x - 14x\Delta x - 7\Delta x^2 //$$

6.)

$$y = 8x^2 + 9x + 7$$

$$y + \Delta y = 8(x + \Delta x)^2 + 9(x + \Delta x) + 7$$

$$\Delta y = 8(x + \Delta x)^2 + 9(x + \Delta x) + 7 - y$$

$$\Delta y = 8(x + \Delta x)^2 + 9(x + \Delta x) + 7 - (8x^2 + 9x + 7)$$

$$\Delta y = 8(x^2 + 2x\Delta x + \Delta x^2) + 9x + 9\Delta x + 7 - 8x^2 - 9x - 7$$

$$\Delta y = \cancel{8x^2} + 16x\Delta x + 8\Delta x^2 + \cancel{9x} + 9\Delta x + \cancel{7} - \cancel{8x^2} - \cancel{9x} - \cancel{7}$$

$$\Delta y = 16x\Delta x + 8\Delta x^2 + 9\Delta x //$$

8.)

$$y = 5x^3$$

$$y + \Delta y = 5(x + \Delta x)^3$$

$$\Delta y = 5(x + \Delta x)^3 - y$$

$$\Delta y = 5(x + \Delta x)^3 - (5x^3)$$

$$\Delta y = 5(x^3 + 3x^2\Delta x + 3x\Delta x^2 + \Delta x^3) - 5x^3$$

$$\Delta y = \cancel{5x^3} + 15x^2\Delta x + 15x\Delta x^2 + 5\Delta x^3 - \cancel{5x^3}$$

$$\Delta y = 15x^2\Delta x + 15x\Delta x^2 + 5\Delta x^3 //$$



10)

$$y = 7x^3 + 3x^2 + 7x - 2$$

$$y + \Delta y = 7(x + \Delta x)^3 + 3(x + \Delta x)^2 + 7(x + \Delta x) - 2$$

$$\Delta y = 7(x + \Delta x)^3 + 3(x + \Delta x)^2 + 7(x + \Delta x) - 2 - y$$

$$\Delta y = 7(x + \Delta x)^3 + 3(x + \Delta x)^2 + 7(x + \Delta x) - 2 - (7x^3 + 3x^2 + 7x - 2)$$

$$\Delta y = 7(x^3 + 3x^2\Delta x + 3x\Delta x^2 + \Delta x^3) + 3(x^2 + 2x\Delta x + \Delta x^2) + 7x + 7\Delta x - 2 - 7x^3 - 3x^2 - 7x + 2$$

$$\Delta y = 7x^3 + 21x^2\Delta x + 21x\Delta x^2 + 7\Delta x^3 + 3x^2 + 6x\Delta x + 3\Delta x^2 + 7\Delta x - 2 - 7x^3 - 3x^2 - 7x + 2$$

$$\Delta y = 21x^2\Delta x + 21x\Delta x^2 + 7\Delta x^3 + 6x\Delta x + 3\Delta x^2 + 7\Delta x$$

12)

$$y = 5x^3 + x^2 - 7$$

$$y + \Delta y = 5(x + \Delta x)^3 + (x + \Delta x)^2 - 7$$

$$\Delta y = 5(x + \Delta x)^3 + (x + \Delta x)^2 - 7 - y$$

$$\Delta y = 5(x + \Delta x)^3 + (x + \Delta x)^2 - 7 - (5x^3 + x^2 - 7)$$

$$\Delta y = 5(x + \Delta x)^3 + (x + \Delta x)^2 - 7 - (5x^3 + x^2 - 7)$$

$$\Delta y = 5(x^3 + 3x^2\Delta x + 3x\Delta x^2 + \Delta x^3) + (x^2 + 2x\Delta x + \Delta x^2) - 7 - 5x^3 - x^2 + 7$$

$$\Delta y = 5x^3 + 15x^2\Delta x + 15x\Delta x^2 + 5\Delta x^3 + x^2 + 2x\Delta x + \Delta x^2 - 7 - 5x^3 - x^2 + 7$$

$$\Delta y = 15x^2\Delta x + 15x\Delta x^2 + 5\Delta x^3 + 2x\Delta x + \Delta x^2$$

14)

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

$$y + \Delta y = \frac{1}{2(x + \Delta x) - 1}$$

$$\Delta y = \frac{1}{2(x + \Delta x) - 1} - y$$

$$\Delta y = \frac{1}{2(x + \Delta x) - 1} - \frac{1}{2x - 1}$$

$$\Delta y = \frac{1}{2x + 2\Delta x - 1} - \frac{1}{2x - 1}$$

$$\Delta y = \frac{1(2x - 1) - 1(2x + 2\Delta x - 1)}{(2x + 2\Delta x - 1)(2x - 1)}$$



$$\Delta y = \frac{2x - 1 - 2x - 2\Delta x + 1}{4x^2 + 4x\Delta x - 2x - 2x - 2\Delta x + 1}$$

$$\Delta y = \frac{-2\Delta x}{4x^2 + 4x\Delta x - 4x - 2\Delta x + 1}, //$$

16)  $y = \frac{3}{2-5x}$

$$y + \Delta y = \frac{3}{2-5(x+\Delta x)}$$

$$\Delta y = \frac{3}{2-5(x+\Delta x)} - y$$

$$\Delta y = \frac{3}{2-5(x+\Delta x)} - \frac{3}{2-5x}$$

$$\Delta y = \frac{3(2-5x) - 3(2-5x-5\Delta x)}{(2-5x-5\Delta x)(2-5x)}$$

$$\Delta y = \frac{6 - 15x - 6 + 15x + 15\Delta x}{4 - 10x - 10\Delta x - 10x + 25x^2 + 25x\Delta x}$$

$$\Delta y = \frac{15\Delta x}{4 - 20x - 10\Delta x + 25x^2 + 25x\Delta x}, //$$

18)  $y = \frac{5}{3x^2 + 2x}$

$$y + \Delta y = \frac{5}{3(x+\Delta x)^2 + 2(x+\Delta x)}$$

$$\Delta y = \frac{5}{3(x+\Delta x)^2 + 2(x+\Delta x)} - y$$



$$\Delta y = \frac{5}{3(x + \Delta x)^2 + 2(x + \Delta x)} - \frac{5}{3x^2 + 2x}$$

$$\Delta y = \frac{5}{3x^2 + 6x\Delta x + 3(\Delta x)^2 + 2x + 2\Delta x} - \frac{5}{3x^2 + 2x}$$

$$\Delta y = \frac{5(3x^2 + 2x) - 5(3x^2 + 6x\Delta x + 3(\Delta x)^2 + 2x + 2\Delta x)}{(3x^2 + 6x\Delta x + 3(\Delta x)^2 + 2x + 2\Delta x)(3x^2 + 2x)}$$

$$\Delta y = \frac{15x^2 + 10x - 15x^2 - 30x\Delta x - 15(\Delta x)^2 - 10x - 10\Delta x}{9x^4 + 18x^3\Delta x + 9x^2(\Delta x)^2 + 6x^3 + 6x^2\Delta x + 6x^3 + 12x^2\Delta x + 6x(\Delta x)^2 + 4x^2 + 4x\Delta x}$$

$$\Delta y = \frac{-30x\Delta x - 15(\Delta x)^2 - 10\Delta x}{9x^4 + 18x^3\Delta x + 9x^2(\Delta x)^2 + 12x^3 + 18x^2\Delta x + 6x(\Delta x)^2 + 4x^2 + 4x\Delta x}$$