b) $f'(2) = 0$ (la recta tangente es horizontal, luego tiene pendiente 0).

c) $f'(4)$ es la pendiente de la recta que pasa por $(3, 3)$ y $(4, 0)$:

$$f'(4) = \frac{0-3}{4-3} = \frac{-3}{1} = -3$$

9 $f'(a) = \lim_{h \to 0} \frac{f(a+h) - f(a)}{h} = \lim_{h \to 0} \frac{(a+h)^2 - a^2}{h} =$

$$= \lim_{h \to 0} \frac{a^2 + h^2 + 2ah - a^2}{h} = \frac{h^2 + 2ah}{h} =$$

$$= \lim_{h \to 0} \frac{h(h + 2a)}{h} = \lim_{h \to 0} (h + 2a) = 2a$$

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10 a) $f'(x) = 3$ b) $f'(x) = \frac{1}{5}$

c) $f'(x) = \frac{-1}{2}$ d) $f'(x) = 1$

e) $f'(x) = 2x$ f) $f'(x) = 0$

g) $f'(x) = 0$ h) $f'(x) = 4x - 1$

i) $f'(x) = \frac{-1}{x^2}$ j) $f'(x) = \frac{-1}{(x+1)^2}$

k) $f'(x) = \frac{-6}{(3x-1)^2}$

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1 $f'(x) = 2$

2 $f'(x) = \frac{3}{4}$

3 $f'(x) = 0$

4 $f'(x) = \frac{1}{2}$

5 $f'(x) = 3x^2 - 6x$

6 $f'(x) = 3x^4 - \frac{4}{3}$

7 $f'(x) = 0$

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8 $f'(x) = \frac{4}{3}\left(2x - \frac{4}{3}\right)$

9 $f'(x) = \frac{2x}{5} - \frac{1}{4}$

10 $f'(x) = \frac{1}{7} - \frac{\sqrt{7}}{2\sqrt{x}}$

11 $f'(x) = \frac{-1}{x^2}$

12 $f'(x) = \frac{-6}{x^3}$

13 $f'(x) = \frac{-5}{x^4}$

14 $f'(x) = \frac{4}{3}\sqrt[3]{x}$

15 $f'(x) = \sqrt{3} \cdot x^{-3/2} \rightarrow f'(x) = \frac{-3\sqrt{3}}{2} \cdot \frac{1}{\sqrt{x^5}} =$

$$= \frac{-3\sqrt{3}}{2\sqrt{x^5}}$$

16 $f'(x) = \frac{3}{2}x^{-5/2} \rightarrow f'(x) = \frac{-15}{4\sqrt{x^7}}$

17 $f'(x) = \frac{-2}{x^2} + \frac{1}{2}$

18 $f'(x) = \frac{1}{3\sqrt[3]{x}} - \frac{1}{3}$

19 $f'(x) = x^{-3/4} \rightarrow f'(x) = \frac{-3}{4\sqrt[4]{x^7}}$

20 $f'(x) = \frac{\sqrt{3}}{\sqrt{x^5}} = \sqrt{3} \cdot x^{-5/2} \rightarrow f'(x) = \frac{-5\sqrt{3}}{2\sqrt{x^7}}$

21 $f'(x) = 2x^{-1/2} - 3x^{-2} + x^{-1} \rightarrow$

$$\rightarrow f'(x) = \frac{-1}{\sqrt{x^3}} + \frac{6}{x^3} - \frac{1}{x^2}$$

22 $f'(x) = 1 - \frac{2}{x^3}$

23 $f'(x) = \frac{2x}{3} + \frac{6}{x^3}$

24 $f'(x) = \frac{x^3}{3} - 4x^{1/2} + 2x^{-3} + x^{2/5} \rightarrow$

$$\rightarrow f'(x) = x^2 - \frac{2}{\sqrt{x}} - \frac{6}{x^4} + \frac{5\sqrt{x^3}}{2}$$

25 $f'(x) = 1 - \frac{1}{x^2}$

Página 10

1 $f'(x) = 3 \cos x + 2 \operatorname{sen} x$

3 $f'(x) = 4(1 + tg^2 x) + e^x = 4 + 4\,tg^2 x + e^x$

4 $f'(x) = 1 \cdot e^x + x \cdot e^x = e^x + xe^x$

5 $f'(x) = 2x \cdot sen\,x + (x^2 + 1) \cdot \cos x =$

$= 2x\,sen\,x + x^2 \cos x + \cos x$

6 $f'(x) = 2^x \cdot ln\,2 \cdot tg\,x + 2^x \cdot (1 + tg^2 x)$

7 $f'(x) = 2x - \left(\frac{1}{3} \cdot e^x + \frac{x}{3} \cdot e^x\right) =$

$= 2x - \frac{1}{3} \cdot e^x - \frac{x}{3} \cdot e^x$

8 $f'(x) = (3x^2 - 2) \cdot \cos x + (x^3 - 2x + 1) \cdot (-sen\,x) =$

$= (3x^2 - 2) \cdot \cos x - (x^3 - 2x + 1) \cdot sen\,x$

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9 $f'(x) = 3^x \cdot ln\,3 + \frac{1}{x} - \frac{1}{x^2}$

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

11 $f'(x) = 2x \cdot e^x + x^2 \cdot e^x + 2 \cdot ln\,x + 2x \cdot \frac{1}{x} =$

$= 2xe^x + x^2 e^x + 2\,ln\,x + 2$

12 $f'(x) = \frac{1}{2\sqrt{x}}\,sen\,x + \sqrt{x}\,\cos x =$

$= \frac{sen\,x}{2\sqrt{x}} + \sqrt{x}\,\cos x = \frac{sen\,x + 2x\cos x}{2\sqrt{x}}$

14 $f(x) = \frac{(x+1)\cdot(x-1)}{2(x+1)} = \frac{(x-1)}{2} \rightarrow$

$\rightarrow f'(x) = \frac{1}{2}$

Otra forma:

$f'(x) = \frac{2x(2x+2) - (x^2-1)\cdot 2}{(2x+2)^2} =$

$= \frac{2x^2 + 4x + 2}{(2x+2)^2} = \frac{2(x+1)^2}{4(x+1)^2} = \frac{1}{2}$

15 $f'(x) = \frac{-3}{(x-2)^2}$

16 $f'(x) = \frac{\frac{1}{x}\cdot x - ln\,x \cdot 1}{x^2} = \frac{1 - ln\,x}{x^2}$

17 $f'(x) = \frac{e^x - e^{-x}}{2}$

18 $f'(x) = \frac{-2x}{(x^2+1)^2}$

19 $f'(x) = \frac{3x^2(x+2) - x^3 \cdot 1}{(x+2)^2} = \frac{2x^3 + 6x^2}{(x+2)^2}$

20 $f'(x) = \frac{2(3x+2) - (2x-1)\cdot 3}{(3x+2)^2} = \frac{7}{(3x+2)^2}$

21 $f'(x) = \frac{2x(x^2-1) - x^2 \cdot 2x}{(x^2-1)^2} = \frac{-2x}{(x^2-1)^2}$

22 $f'(x) = \frac{\frac{1}{2\sqrt{x}}(x+2) - \sqrt{x}\cdot 1}{(x+2)^2} = \frac{-x+2}{2\sqrt{x}\cdot(x+2)^2}$

23 $f'(x) = 2x \cdot \sqrt{x} + (x^2 - 1) \cdot \frac{1}{2\sqrt{x}} =$

$= \frac{4x^2 + x^2 - 1}{2\sqrt{x}} = \frac{5x^2 - 1}{2\sqrt{x}}$

24 $f'(x) = \frac{3}{\sqrt{1-x^2}}$

25 $f'(x) = \frac{-2}{\sqrt{1-x^2}} + e^x$

26 $f'(x) = \frac{5}{1+x^2}$

27 $f'(x) = \frac{1 \cdot e^x + x\,e^x - \frac{1}{x}}{2} = \frac{x\,e^x + x^2 e^x - 1}{2x}$

28 $f'(x) = 3^x \cdot ln\,3 \cdot sen\,x + 3^x \cdot \cos x - \Big(log_2 x +$

$+ x \cdot \frac{1}{x} \cdot \frac{1}{ln\,2}\Big) = 3^x\,ln\,3 \cdot sen\,x +$

$+ 3^x \cos x - log_2 x - \frac{1}{ln\,2}$

Página 13

1 $f'(x) = 6(x^2+5)^5(2x) = 12x(x^2+5)^5$

2 $f'(x) = \cos(x^2 - 1) \cdot 2x = 2x\cos(x^2 - 1)$

3 $f'(x) = -sen\,(ln\,x) \cdot \frac{1}{x} = \frac{-1}{x}\,sen\,(ln\,x)$

4 $f'(x) = [1 + tg^2(2x - 3x^2)] \cdot (2 - 6x)$

5 $f'(x) = e^{3x^2+1} \cdot 6x = 6x \cdot e^{3x^2+1}$

6 $f'(x) = 2^{4x+1} \cdot ln\,2 \cdot 4 = (4 \cdot ln\,2) \cdot 2^{4x+1}$

7 $f'(x) = 2\cos x\,(-sen\,x) = -2\cos x\;sen\,x$

8 $f'(x) = e^{3x} \cdot 3 = 3 \cdot e^{3x}$

9 $f'(x) = \frac{6x}{3x^2 - 6}$

10 $f'(x) = \dfrac{3x}{\dfrac{3x^2-1}{2}} = \dfrac{6x}{3x^2-1}$

11 $f'(x) = \dfrac{6x+2}{1+(3x^2+2x)^2} = \dfrac{6x+2}{9x^4+12x^3+4x^2+1}$

12 $f'(x) = \dfrac{2x}{\sqrt{1-x^4}}$

13 $f'(x) = \dfrac{-3x^2}{\sqrt{1-(x^3-1)^2}} = \dfrac{-3x^2}{\sqrt{2x^3-x^6}} =$

$= \dfrac{-3x^2}{x\sqrt{2x-x^4}} = \dfrac{-3x}{\sqrt{2x-x^4}}$

14 $f'(x) = (\cos(3x^2-1)^2)\cdot 2(3x^2-1)\cdot 6x =$
$= 12x(3x^2-1)\cos(3x^2-1)^2$

15 $f'(x) = 2\,\text{sen}(3x^2-1)\cdot\cos(3x^2-1)\cdot 6x =$
$= 12x\,\text{sen}(3x^2-1)\cos(3x^2-1)$

16 $f'(x) = 3^{\cos x}\cdot \ln 3\cdot(-\text{sen}\,x) = -\text{sen}\,x\cdot\ln 3\cdot 3^{\cos x}$

17 $f'(x) = \dfrac{1}{\dfrac{x+1}{x-2}}\cdot\dfrac{1\cdot(x-2)-(x+1)\cdot 1}{(x-2)^2} =$

$= \dfrac{(x-2)}{(x+1)}\cdot\dfrac{-3}{(x-2)^2} = \dfrac{-3}{(x+1)(x-2)} =$

$= \dfrac{-3}{x^2-x-2}$

18 $f'(x) = 2\left(\dfrac{x^2-1}{x+2}\right)\cdot\dfrac{2x(x+2)-(x^2-1)\cdot 1}{(x+2)^2} =$

$= \dfrac{2(x^2-1)(x^2+4x+1)}{(x+2)^3}$

19 $f'(x) = \dfrac{2x-4}{2\sqrt{x^2-4x}} = \dfrac{x-2}{\sqrt{x^2-4x}}$

20 $f'(x) = \dfrac{1\cdot(x-2)^2-(x+1)\cdot 2(x-2)}{(x-2)^4} =$

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

21 $f'(x) = \dfrac{2(2x+1)\cdot 2(x-1)-(2x+1)^2\cdot 1}{(x-1)^2} =$

$= \dfrac{(2x+1)(2x-5)}{(x-1)^2} = \dfrac{4x^2-8x-5}{(x-1)^2}$

22 $f'(x) = \dfrac{2(3x-1)\cdot 3(2x+1)-(3x-1)^2\cdot 2}{(2x+1)^2} =$

$= \dfrac{(3x-1)(6x+8)}{(2x+1)^2} = \dfrac{18x^2+18x-8}{(2x+1)^2}$

23 $f'(x) = \dfrac{e^x(x-1)^2-e^x\cdot 2(x-1)}{(x-1)^4} =$

$= \dfrac{e^x(x-1)(x-1-2)}{(x-1)^4} = \dfrac{e^x(x-3)}{(x-1)^3}$

Página 14

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

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

3 $f'(x) = \dfrac{2x-2}{5}$

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

5 $f'(x) = \dfrac{1}{2\sqrt{x}} + \dfrac{6}{x^4}$

6 $f'(x) = \dfrac{-1}{x^2} - \dfrac{1}{9\sqrt[3]{x^4}} + 4x$

7 $f'(x) = \dfrac{-5}{3\sqrt[3]{x^8}} - \dfrac{2x}{3}$

8 $f'(x) = x^2 - 3x^3 + 2 + \dfrac{1}{x}$

$f'(x) = 2x - 9x^2 - \dfrac{1}{x^2}$

9 $f'(x) = \dfrac{-3}{x^3} - \dfrac{4x}{3}$

10 $f'(x) = \dfrac{-3\sqrt{2}}{2\sqrt{x^5}} - \dfrac{2x}{3}$

11 $f'(x) = \dfrac{3}{2x}$

12 $f'(x) = \cos^2 x - \text{sen}^2 x$

13 $f'(x) = \dfrac{e^x(x^2-1)-e^x\cdot 2x}{(x^2-1)^2} = \dfrac{(x^2-2x-1)e^x}{(x^2-1)^2}$

14 $f'(x) = \dfrac{2x(2x+1)-(x^2-1)\cdot 2}{(2x+1)^2} = \dfrac{2x^2+2x+2}{(2x+1)^2}$

15 $f'(x) = 2x\,e^x + (x^2-1)e^x - \dfrac{1}{x} =$

$= (x^2+2x-1)e^x - \dfrac{1}{x}$

16 $f'(x) = 2^x\cdot\ln 2 - 3(1+tg^2 x) =$
$= 2^x\cdot\ln 2 - 3 - 3\,tg^2 x$

17 $f'(x) = 3x^2e^x + x^3e^x + 2x\,\text{sen}\,x + x^2\cos x$

18 $f'(x) = \dfrac{1\cdot(3x-2)-(x-1)\cdot 3}{(3x-2)^2} = \dfrac{1}{(3x-2)^2}$

19 $f'(x) = \dfrac{\dfrac{1}{2\sqrt{x}}\, sen\, x - \sqrt{x}\, cos\, x}{sen^2\, x} =$

$= \dfrac{sen\, x - 2x\, cos\, x}{2\sqrt{x}\, sen^2\, x}$

Página 15

20 $f'(x) = 4\,(x^2 - 1)^3 \cdot 2x = 8x\,(x^2 - 1)^3$

21 $f'(x) = 3\left(\dfrac{x-1}{x+2}\right)^2 \cdot \dfrac{3}{(x+2)^2} = \dfrac{9\,(x-1)^2}{(x+2)^4}$

22 $f'(x) = \dfrac{2\,(x+1)^2 - (2x-1)\cdot 2\,(x+1)}{(x+1)^4} =$

$= \dfrac{(x+1)\cdot(2x+2-4x+2)}{(x+1)^4} = \dfrac{-2x+4}{(x+1)^3}$

23 $f'(x) = \dfrac{(x-1)^3 - (x+1)\cdot 3\,(x-1)^2}{(x-1)^6} =$

$= \dfrac{(x-1)^2\,(x-1-3x-3)}{(x-1)^6} = \dfrac{-2x-4}{(x-1)^4}$

24 $f'(x) = \dfrac{1}{\dfrac{x-1}{x+4}} \cdot \dfrac{5}{(x+4)^2} = \dfrac{(x+4)}{(x-1)} \cdot \dfrac{5}{(x+4)^2} =$

$= \dfrac{5}{(x-1)\,(x+4)} = \dfrac{5}{x^2+3x-4}$

25 $f'(x) = 2\, cos\,(3x-2)\cdot(-sen\,(3x-2))\cdot 3 =$

$= -6\, cos\,(3x-2)\, sen\,(3x-2)$

26 $f'(x) = \dfrac{cos\, x}{2\sqrt{sen\, x}}$

27 $f'(x) = \dfrac{2x\, cos\, x^2}{sen\, x^2}$

28 $f'(x) = e^{4x-1}\cdot 4\, sen(3x^2) + e^{4x-1}\cdot cos(3x^2)\, 6x =$

$= 4\,e^{4x-1}\, sen\,(3x^2) + 6x\, e^{4x-1}\, cos\,(3x^2)$

29 $f'(x) = 2^{4x^2-1}\cdot ln\, 2 \cdot 8x \cdot ln\,(8x) + 2^{4x^2-1} \cdot \dfrac{8}{8x} =$

$= 2^{4x^2-1}\cdot ln\, 2\cdot 8x\cdot ln\,(8x) + \dfrac{2^{4x^2-1}}{x}$

30 $f'(x) = \dfrac{2\,(2x+3)\cdot 2\,(1-x) - (2x+3)^2\cdot(-1)}{(1-x)^2} =$

$= \dfrac{(2x+3)\,(-2x+7)}{(1-x)^2} = \dfrac{-4x^2+8x+21}{(1-x)^2}$

31 $f'(x) = \left[1 + tg^2\left(\dfrac{2}{x-3}\right)\right]\cdot \dfrac{-2}{(x-3)^2}$

32 $f'(x) = \dfrac{e^{5x+1}\cdot 5\cdot(x+2) - e^{5x+1}\cdot 1}{(x+2)^2} =$

$= \dfrac{e^{5x+1}\,(5x+9)}{(x+2)^2}$

33 $f'(x) = \dfrac{2\, ln\, x\cdot \dfrac{1}{x}\cdot x - ln^2\, x\cdot 1}{x^2} = \dfrac{2\, ln\, x - ln^2\, x}{x^2}$

34 $f'(x) = \dfrac{(e^x + x\, e^x)\,(x+2) - x\, e^x}{(x+2)^2} =$

$= \dfrac{(x^2+2x+2)\, e^x}{(x+2)^2}$

35 $f'(x) = \dfrac{\dfrac{1}{2\sqrt{x-1}}\cdot(3x+4) - \sqrt{x-1}\cdot 3}{(3x+4)^2} =$

$= \dfrac{-3x+2}{2\sqrt{x-1}\,(3x+4)^2}$

36 $f'(x) = \dfrac{1}{2\sqrt{\dfrac{3x+1}{x+2}}}\cdot\dfrac{3\,(x+2)-(3x+1)\cdot 1}{(x+2)^2} =$

$= \dfrac{\sqrt{x+2}}{2\sqrt{3x+1}}\cdot\dfrac{5}{(x+2)^2}$

37 $f'(x) = \dfrac{2x}{1+(x^2+2)^2} = \dfrac{2x}{x^4+4x^2+5}$

38 $f'(x) = \dfrac{1}{2\sqrt{arc\, tg\, x}}\cdot\dfrac{1}{1+x^2} = \dfrac{1}{2(1+x^2)\sqrt{arc\, tg\, x}}$

39 $f'(x) = \dfrac{3}{4}\cdot\dfrac{2}{\sqrt{1-(2x-1)^2}} = \dfrac{3}{2\sqrt{-4x^2+4x}}$

40 $f'(x) = \dfrac{-1}{\sqrt{1-(\sqrt{x})^2}}\cdot\dfrac{1}{2\sqrt{x}} = \dfrac{-1}{\sqrt{1-x}}\cdot\dfrac{1}{2\sqrt{x}} =$

$= \dfrac{-1}{2\sqrt{x-x^2}}$

Página 16

1 $f'(x) = \dfrac{-x^2+4x-10}{(x-2)^2}$, $f'(1) = \dfrac{-15}{9}$;

$f'(3) = -7$; $f'(5) = \dfrac{-15}{9}$

2 $f'(x) = \dfrac{4}{3}\left(\dfrac{x}{3}+1\right)^3$, $f'(-4) = \dfrac{-4}{81}$; $f'(-3) = 0$;

$f'(0) = \dfrac{4}{3}$; $f'(1) = \dfrac{256}{81}$

3 $f'(x) = \dfrac{e^x - e^{-x}}{2}$, $f'(-2) \simeq 3{,}63$; $f'(0) = 0$;

$f'(3) = 10{,}02$