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Guía Nº6

PARTE 1

Derive;

1. $f(x) = 4$
2. $f(x) = -3$
3. $f(x) = \frac{1}{4}$
4. $f(x) = \sqrt{5}$
5. $f(x) = x$
6. $f(x) = x^2$
7. $f(x) = x^3$
8. $f(x) = x^4$
9. $f(x) = x^5$
10. $f(x) = x^6$
11. $f(x) = x^{-1}$
12. $f(x) = x^{-2}$
13. $f(x) = x^{-3}$
14. $f(x) = x^{\frac{1}{2}}$
15. $f(x) = x^{\frac{2}{5}}$
16. $f(x) = x^{-\frac{5}{4}}$
17. $f(x) = e^x$
18. $f(x) = 2^x$
19. $f(x) = 3^x$
20. $f(x) = 5^x$
21. $f(x) = \ln(x)$

22. $f(x) = \log_2(x)$

23. $f(x) = \log_3(x)$

24. $f(x) = \log_5(x)$

25. $f(x) = \sqrt{x}$

26. $f(x) = \sqrt[3]{x}$

27. $f(x) = \sqrt[4]{x}$

28. $f(x) = \sqrt[5]{x}$

29. $f(x) = \sqrt[6]{x}$

30. $f(x) = \sqrt[7]{x}$

PARTE 2

Derive

1. $y = 2x^3 + 4x^2 - 5x + 8$
2. $y = -5 + 3x - \frac{3}{2}x^2 - 7x^3$
3. $y = (x-2)^4$
4. $y = (x^2+2)^3$
5. $y = (4-x^2)^{10}$
6. $y = (2x^2 + 4x - 5)^6$
7. $y = \frac{1}{5}x^{\frac{5}{2}} + \frac{1}{3}x^{\frac{3}{2}}$
8. $y = (x^2-4)^{\frac{3}{2}}$
9. $y = (1-x^2)^{\frac{1}{2}}$
10. $y = \frac{6}{x} + \frac{4}{x^2} - \frac{3}{x^3}$
11. $y = x^3(x+1)^2$
12. $y = (x+1)^3(x-3)^2$
13. $y = (x+2)^2(2-x)^3$
14. $y = \frac{x+1}{x-1}$
15. $y = \frac{x^2+2x-3}{x^2}$
16. $y = \frac{x^2+1}{x^2+2}$
17. $y = \frac{1}{(2x+1)^3}$
18. $y = \frac{1}{(x^2-9)^{\frac{1}{2}}}$

19. $y = \dfrac{1}{(16 - x^2)^{\frac{1}{2}}}$

20. $y = \dfrac{x}{(x + 1)^{\frac{1}{2}}}$

22. $y = \dfrac{(x^2 + 2)^{\frac{1}{2}}}{x}$

23. $y = e^{x^2+1}$

24. $y = x^2 e^{-x^2}$

25. $y = \dfrac{e^{2x}}{x^2}$

26. $y = \sin(3x^2 + x)$

27. $y = \tan(\sqrt{x} - x^9)$

28. $y = \sec(e^x + x)$

29. $y = \sin\left(\dfrac{2 + x^2}{1 - x^3}\right)$

30. $y = (x^3 + 5)\cos(9x)$

PARTE 3

Derive:

1. $f(x) = (x^3 + 4x - 3)^5$
2. $f(x) = (2x^5 - 5x - 2)^7$
3. $f(x) = \sqrt{x^4 - 3x + 6}$
4. $f(x) = \sqrt{x^5 + x + 1}$
5. $f(x) = e^{x^3+5x-2}$
6. $f(x) = e^{2x^5-3x^2+x-2}$
7. $f(x) = \ln(x^5 - 2x + 7)$
8. $f(x) = \ln(2x^4 - x + 5)$
9. $f(x) = \cos(x^3)$
10. $f(x) = \sin(x^6)$
11. $f(x) = \sin\left(e^{x^3}\right)$
12. $f(x) = \sin^3(x^4)$
13. $f(x) = \sin^4(\cos^2(x^3))$
14. $f(x) = \ln(\sin(x^5))$
15. $f(x) = \sin(\ln(\sin(x)))$
16. $f(x) = (x^3 + x^2 + 4)^6$
17. $f(x) = \sin\left((x^4 + 2)^4\right)$
18. $f(x) = e^{x^3-4x}$
19. $f(x) = e^{\sin(x^2)}$
20. $f(x) = \cos^2\left(e^{x^2}\right)$
21. $f(x) = \ln^3(\sin(e^{2x}))$

PARTE 4

En cada caso, determine $f'(x)$. Suponga que g es derivable en IR

1. $f(x) = g\left(\frac{1}{x^2}\right)$ donde $g'(x) = \frac{1}{x^4+1}$

2. $f(x) = g(\sin(x))$ donde $g'(x) = \frac{1}{x^2+1}$

3. $f(x) = g^2(x^2)$ donde $g'(x) = \frac{1}{x^2+2}$

4. $f(x) = g(g(x^3))$ donde $g'(x) = e^{x^2}$

5. $f(x) = g(g^2(2x))$ donde $g'(x) = \sin(x^2)$

Solución:

PARTE 1

1. $f(x) = 4$ $f'(x) = 0$
2. $f(x) = -3$ $f'(x) = 0$
3. $f(x) = \frac{1}{4}$ $f'(x) = 0$
4. $f(x) = \sqrt{5}$ $f'(x) = 0$
5. $f(x) = x$ $f'(x) = 1$
6. $f(x) = x^2$ $f'(x) = 2x$
7. $f(x) = x^3$ $f'(x) = 3x^2$
8. $f(x) = x^4$ $f'(x) = 4x^3$
9. $f(x) = x^5$ $f'(x) = 5x^4$
10. $f(x) = x^6$ $f'(x) = 6x^5$
11. $f(x) = x^{-1}$ $f'(x) = (-1)x^{-1-1} = -x^{-2}$
12. $f(x) = x^{-2}$ $f'(x) = -2x^{-2-1} = -2x^{-3}$
13. $f(x) = x^{-3}$ $f'(x) = -3x^{-3-1} = -3x^{-4}$
14. $f(x) = x^{\frac{1}{2}}$ $f'(x) = \frac{1}{2}x^{\frac{1}{2}-1} = \frac{1}{2}x^{-\frac{1}{2}}$
15. $f(x) = x^{\frac{2}{5}}$ $f'(x) = \frac{2}{5}x^{\frac{2}{5}-1} = \frac{2}{5}x^{-\frac{3}{5}}$
16. $f(x) = x^{-\frac{5}{4}}$ $f'(x) = -\frac{5}{4}x^{-\frac{5}{4}-1} = -\frac{5}{4}x^{-\frac{9}{4}}$
17. $f(x) = e^x$ $f'(x) = e^x$
18. $f(x) = 2^x$ $f'(x) = 2^x \ln(2)$
19. $f(x) = 3^x$ $f'(x) = 3^x \ln(3)$
20. $f(x) = 5^x$ $f'(x) = 5^x \ln(5)$
21. $f(x) = \ln(x)$ $f'(x) = \frac{1}{x}$
22. $f(x) = \log_2(x)$ $f'(x) = \frac{1}{x\ln(2)}$

23. $f(x) = \log_3(x)$ $\quad f'(x) = \dfrac{1}{x\ln(3)}$

24. $f(x) = \log_5(x)$ $\quad f'(x) = \dfrac{1}{x\ln(5)}$

25. $f(x) = \sqrt{x}$ $\quad f'(x) = \dfrac{1}{2\sqrt{x}}$

26. $f(x) = \sqrt[3]{x}$ $\quad f'(x) = \dfrac{1}{3\sqrt[3]{x^2}}$

27. $f(x) = \sqrt[4]{x}$ $\quad f'(x) = \dfrac{1}{4\sqrt[4]{x^3}}$

28. $f(x) = \sqrt[5]{x}$ $\quad f'(x) = \dfrac{1}{5\sqrt[5]{x^4}}$

29. $f(x) = \sqrt[6]{x}$ $\quad f'(x) = \dfrac{1}{5\sqrt[5]{x^4}}$

30. $f(x) = \sqrt[7]{x}$ $\quad f'(x) = \dfrac{1}{7\sqrt[7]{x^6}}$

PARTE 2

1. $y = 2x^3 + 4x^2 - 5x + 8$

   $y' = 6x^2 + 8x - 5$

2. $y = -5 + 3x - \frac{3}{2}x^2 - 7x^3$

   $y' = 3 - 3x - 21x^2$

3. $y = (x-2)^4$

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

4. $y = (x^2+2)^3$

   $y' = 3(x^2+2)^2 \bullet 2x = 6x(x^2+2)^2$

5. $y = (4-x^2)^{10}$

   $y' = 10(4-x^2)^9 \bullet (-2x) = -20x(4-x^2)^9$

6. $y = (2x^2+4x-5)^6$

   $y' = 6(2x^2+4x-5)^5 \bullet (4x+4) = 24(x+1)(2x^2+4x-5)^5$

7. $y = \frac{1}{5}x^{\frac{5}{2}} + \frac{1}{3}x^{\frac{3}{2}}$

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

8. $y = (x^2-4)^{\frac{3}{2}}$

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

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

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

10. $y = \frac{6}{x} + \frac{4}{x^2} - \frac{3}{x^3}$

$y = 6x^{-1} + 4x^{-2} - 3x^{-3}$

$y' = -6x^{-2} - 8x^{-3} + 9x^{-4} = -\frac{6}{x^2} - \frac{8}{x^3} + \frac{9}{x^4}$

11. $y = x^3(x + 1)^2$

$y' = 3x^2(x + 1)^2 + x^3 \bullet 2(x + 1) = x^2(x + 1)(3(x + 1) + 2x)$

$y' = x^2(x + 1)(5x + 3)$

12. $y = (x + 1)^3(x - 3)^2$

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

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

$y' = (x + 1)^2(x - 3)(5x - 7)$

13. $y = (x + 2)^2(2 - x)^3$

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

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

$y' = (x + 2)(2 - x)^2(-5x - 2)$

$y' = -(x + 2)(2 - x)^2(5x + 2)$

14. $y = \frac{x + 1}{x - 1}$

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

15. $y = \dfrac{x^2 + 2x - 3}{x^2}$

$y' = \dfrac{(2x+2)x^2 - (x^2 + 2x - 3) \bullet 2x}{x^4}$

$y' = \dfrac{x((2x+2)x - (x^2 + 2x - 3) \bullet 2)}{x^4}$

$y' = \dfrac{2x^2 + 2x - 2x^2 - 4x + 6}{x^3}$

$y' = \dfrac{6 - 2x}{x^3}$

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

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

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

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

17. $y = \dfrac{1}{(2x+1)^3}$

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

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

18. $y = \dfrac{1}{(x^2 - 9)^{\frac{1}{2}}}$

$y = (x^2 - 9)^{-\frac{1}{2}}$

$y' = -\dfrac{1}{2}(x^2 - 9)^{-\frac{3}{2}} \bullet 2x = -\dfrac{x}{(x^2 - 9)^{\frac{3}{2}}}$

19. $y = \dfrac{1}{(16 - x^2)^{\frac{1}{2}}}$

$y = (16 - x^2)^{-\frac{1}{2}}$

$y' = -\frac{1}{2}(16 - x^2)^{-\frac{3}{2}} \bullet (-2x) = \dfrac{x}{(16 - x^2)^{\frac{3}{2}}}$

20. $y = \dfrac{x}{(x+1)^{\frac{1}{2}}}$

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

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

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

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

22. $y = \dfrac{(x^2+2)^{\frac{1}{2}}}{x}$

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

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

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

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

23. $y = e^{x^2+1}$

$y' = e^{x^2+1} \bullet 2x = 2xe^{x^2+1}$

24. $y = x^2e^{-x^2}$

$y' = 2xe^{-x^2} + x^2e^{-x^2} \bullet -2x = 2xe^{-x^2} - 2x^3e^{-x^2}$

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

25. $y = \dfrac{e^{2x}}{x^2}$

$y' = \dfrac{e^{2x} \bullet 2 \bullet x^2 - e^{2x} \bullet 2x}{(x^2)^2} = \dfrac{2e^{2x}x^2 - 2xe^{2x}}{x^4}$

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

26. $y = \sin(3x^2 + x)$

$y' = \cos(3x^2 + x) \bullet (6x + 1) = (6x + 1)\cos(3x^2 + x)$

27. $y = \tan(\sqrt{x} - x^9)$

$y' = \sec^2(\sqrt{x} - x^9)\left(\dfrac{1}{2\sqrt{x}} - 9x^8\right)$

28. $y = \sec(e^x + x)$

$y' = \sec(e^x + x)\tan(e^x + x)(e^x + 1)$

29. $y = \sin\left(\dfrac{2 + x^2}{1 - x^3}\right)$

$y' = \cos\left(\dfrac{2 + x^2}{1 - x^3}\right) \bullet \dfrac{2x(1 - x^3) - (2 + x^2) \bullet (-3x^2)}{(1 - x^3)^2}$

$y' = \cos\left(\dfrac{2 + x^2}{1 - x^3}\right)\left(\dfrac{2x + x^4 + 6x^2}{(1 - x^3)^2}\right)$

30. $y = (x^3 + 5)\cos(9x)$

$y' = 3x^2\cos(9x) + (x^3 + 5) \bullet (-\sin(9x) \bullet 9)$

$y' = 3x^2\cos(9x) - 9(x^3 + 5)\sin(9x)$

PARTE 3

1. $f(x) = (x^3 + 4x - 3)^5$

$f'(x) = 5(x^3 + 4x - 3)^4 \bullet (x^3 + 4x - 3)'$

$f'(x) = 5(x^3 + 4x - 3)^4(3x^2 + 4)$

2. $f(x) = (2x^5 - 5x - 2)^7$

$f'(x) = 7(2x^5 - 5x - 2)^6 \bullet (2x^5 - 5x - 2)'$

$f'(x) = 7(2x^5 - 5x - 2)^6(10x^4 - 5)$

3. $f(x) = \sqrt{x^4 - 3x + 6}$

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

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

4. $f(x) = \sqrt{x^5 + x + 1}$

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

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

5. $f(x) = e^{x^3+5x-2}$

$f'(x) = e^{x^3+5x-2} \bullet (x^3 + 5x - 2)'$

$f'(x) = e^{x^3+5x-2} \bullet (3x^2 + 5) = e^{x^3+5x-2}(3x^2 + 5)$

6. $f(x) = e^{2x^5-3x^2+x-2}$

$f'(x) = e^{2x^5-3x^2+x-2} \bullet (2x^5 - 3x^2 + x - 2)'$

$f'(x) = e^{2x^5-3x^2+x-2} \bullet (10x^4 - 6x + 1) = e^{2x^5-3x^2+x-2}(10x^4 - 6x + 1)$

7. $f(x) = \ln(x^5 - 2x + 7)$

$f'(x) = \dfrac{1}{x^5 - 2x + 7} \bullet (x^5 - 2x + 7)'$

$f'(x) = \dfrac{1}{x^5 - 2x + 7} \bullet (5x^4 - 2) = \dfrac{5x^4 - 2}{x^5 - 2x + 7}$

8. $f(x) = \ln(2x^4 - x + 5)$

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

$f'(x) = \dfrac{1}{2x^4 - x + 5} \bullet (8x^3 - 1) = \dfrac{8x^3 - 1}{2x^4 - x + 5}$

9. $f(x) = \cos(x^3)$

$f'(x) = -\sin(x^3) \bullet (x^3)'$

$f'(x) = -\sin(x^3) \bullet 3x^2 = -3x^2 \sin(x^3)$

10. $f(x) = \sin(x^6)$

$f'(x) = \cos(x^6) \bullet (x^6)'$

$f'(x) = \cos(x^6) \bullet 6x^5 = 6x^5 \cos(x^6)$

11. $f(x) = \sin\left(e^{x^3}\right)$

$f'(x) = \cos\left(e^{x^3}\right) \bullet \left(e^{x^3}\right)'$

$f'(x) = \cos\left(e^{x^3}\right) \bullet e^{x^3} \bullet (x^3)'$

$f'(x) = \cos\left(e^{x^3}\right) \bullet e^{x^3} \bullet 3x^2 = 3x^2 e^{x^3} \cos\left(e^{x^3}\right)$

12. $f(x) = \sin^3(x^4)$

$f'(x) = 3\sin^2(x^4) \bullet (\sin(x^4))'$

$f'(x) = 3\sin^2(x^4) \bullet \cos(x^4) \bullet (x^4)'$

$f'(x) = 3\sin^2(x^4) \bullet \cos(x^4) \bullet 4x^3$

$f'(x) = 3\sin^2(x^4) \bullet \cos(x^4) \bullet 4x^3 = 12\sin^2(x^4)\cos(x^4)x^3$

13. $f(x) = \sin^4(\cos^2(x^3))$

$f'(x) = 4\sin^3(\cos^2(x^3)) \bullet (\sin(\cos^2(x^3)))'$

$f'(x) = 4\sin^3(\cos^2(x^3)) \bullet \cos(\cos^2(x^3)) \bullet (\cos^2(x^3))'$

$f'(x) = 4\sin^3(\cos^2(x^3)) \bullet \cos(\cos^2(x^3)) \bullet 2\cos(x^3) \bullet (\cos(x^3))'$

$f'(x) = 4\sin^3(\cos^2(x^3)) \bullet \cos(\cos^2(x^3)) \bullet 2\cos(x^3) \bullet (-\sin(x^3)) \bullet (x^3)'$

$f'(x) = 4\sin^3(\cos^2(x^3)) \bullet \cos(\cos^2(x^3)) \bullet 2\cos(x^3) \bullet (-\sin(x^3)) \bullet 3x^2$

$f'(x) = -24x^2 \sin^3(\cos^2(x^3))\cos(\cos^2(x^3))\cos(x^3)\sin(x^3)$

14. $f(x) = \ln(\sin(x^5))$

$f'(x) = \frac{1}{\sin(x^5)} \bullet (\sin(x^5))'$

$f'(x) = \frac{1}{\sin(x^5)} \bullet \cos(x^5) \bullet (x^5)'$

$f'(x) = \frac{1}{\sin(x^5)} \bullet \cos(x^5) \bullet 5x^4 = \frac{5x^4\cos(x^5)}{\sin(x^5)}$

15. $f(x) = \sin(\ln(\sin(x)))$

$f'(x) = \cos(\ln(\sin(x))) \bullet (\ln(\sin(x)))'$

$f'(x) = \cos(\ln(\sin(x))) \bullet \frac{1}{\sin(x)} \bullet (\sin(x))'$

$f'(x) = \cos(\ln(\sin(x))) \bullet \frac{1}{\sin(x)} \bullet \cos(x) = \frac{\cos(\ln(\sin(x)))\cos(x)}{\sin(x)}$

16. $f(x) = (x^3 + x^2 + 4)^6$

$f'(x) = 6(x^3 + x^2 + 4)^5 \bullet (x^3 + x^2 + 4)'$

$f'(x) = 6(x^3 + x^2 + 4)^5 \bullet (3x^2 + 2x + 0) = 6(x^3 + x^2 + 4)^5(3x^2 + 2x)$

17. $f(x) = \sin\left((x^4 + 2)^4\right)$

$f'(x) = \cos\left((x^4 + 2)^4\right) \bullet \left((x^4 + 2)^4\right)'$

$f'(x) = \cos\left((x^4 + 2)^4\right) \bullet 4(x^4 + 2)^3 \bullet (x^4 + 2)'$

$f'(x) = \cos\left((x^4 + 2)^4\right) \bullet 4(x^4 + 2)^3 \bullet (4x^3 + 0) = 16x^3(x^4 + 2)^3 \cos\left((x^4 + 2)^4\right)$

18. $f(x) = e^{x^3 - 4x}$

$f'(x) = e^{x^3 - 4x} \bullet (x^3 - 4x)'$

$f'(x) = e^{x^3 - 4x} \bullet (3x^2 - 4) = (3x^2 - 4)e^{x^3 - 4x}$

19. $f(x) = e^{\sin(x^2)}$

$f'(x) = e^{\sin(x^2)} \bullet (\sin(x^2))'$

$f'(x) = e^{\sin(x^2)} \bullet \cos(x^2) \bullet (x^2)'$

$f'(x) = e^{\sin(x^2)} \bullet \cos(x^2) \bullet 2x = 2xe^{\sin(x^2)} \cos(x^2)$

20. $f(x) = \cos^2\left(e^{x^2}\right)$

$$f'(x) = 2\cos\left(e^{x^2}\right) \bullet \left(\cos\left(e^{x^2}\right)\right)'$$

$$f'(x) = 2\cos\left(e^{x^2}\right) \bullet \left(-\sin\left(e^{x^2}\right)\right) \bullet \left(e^{x^2}\right)'$$

$$f'(x) = 2\cos\left(e^{x^2}\right) \bullet \left(-\sin\left(e^{x^2}\right)\right) \bullet e^{x^2} \bullet (x^2)'$$

$$f'(x) = 2\cos\left(e^{x^2}\right) \bullet \left(-\sin\left(e^{x^2}\right)\right) \bullet e^{x^2} \bullet 2x$$

$$f'(x) = -4x\cos\left(e^{x^2}\right)\sin\left(e^{x^2}\right)e^{x^2}$$

21. $f(x) = \ln^3(\sin(e^{2x}))$

$$f'(x) = 3\ln^2(\sin(e^{2x})) \bullet (\ln(\sin(e^{2x})))'$$

$$f'(x) = 3\ln^2(\sin(e^{2x})) \bullet \frac{1}{\sin(e^{2x})} \bullet (\sin(e^{2x}))'$$

$$f'(x) = 3\ln^2(\sin(e^{2x})) \bullet \frac{1}{\sin(e^{2x})} \bullet \cos(e^{2x}) \bullet (e^{2x})'$$

$$f'(x) = 3\ln^2(\sin(e^{2x})) \bullet \frac{1}{\sin(e^{2x})} \bullet \cos(e^{2x}) \bullet e^{2x} \bullet (2x)'$$

$$f'(x) = 3\ln^2(\sin(e^{2x})) \bullet \frac{1}{\sin(e^{2x})} \bullet \cos(e^{2x}) \bullet e^{2x} \bullet 2$$

$$f'(x) = \frac{6\ln^2(\sin(e^{2x}))\cos(e^{2x})e^{2x}}{\sin(e^{2x})}$$

PARTE 4

1. $f(x) = g\left(\frac{1}{x^2}\right)$ donde $g'(x) = \frac{1}{x^4+1}$

$$f'(x) = g'\left(\frac{1}{x^2}\right) \bullet \left(\frac{1}{x^2}\right)'$$

$$f'(x) = \frac{1}{\left(\frac{1}{x^2}\right)^4 + 1} \bullet \left(-\frac{2}{x^3}\right)$$

$$f'(x) = \frac{x^8}{1+x^8} \bullet \left(-\frac{2}{x^3}\right)$$

$$f'(x) = \frac{-2x^5}{1+x^8}$$

2. $f(x) = g(\sin(x))$ donde $g'(x) = \frac{1}{x^2+1}$

$$f'(x) = g'(\sin(x)) \bullet (\sin(x))'$$

$$f'(x) = \frac{1}{(\sin(x))^2 + 1} \bullet \cos(x)$$

$$f'(x) = \frac{\cos(x)}{\sin^2(x) + 1}$$

3. $f(x) = g^2(x^2)$ donde $g'(x) = \frac{1}{x^2+2}$

$$f'(x) = 2g(x^2) \bullet g'(x^2) \bullet 2x$$

$$f'(x) = 2g(x^2) \bullet \frac{1}{(x^2)^2 + 2} \bullet 2x$$

$$f'(x) = \frac{4xg(x^2)}{x^4+2}$$

4. $f(x) = g(g(x^3))$ donde $g'(x) = e^{x^2}$

$$f'(x) = g'(g(x^3)) \bullet g'(x^3) \bullet 3x^2$$

$$f'(x) = e^{(g(x^3))^2} \bullet e^{(x^3)^2} \bullet 3x^2$$

$$f'(x) = 3x^2 e^{g^2(x^3)} e^{x^6}$$

$$f'(x) = 3x^2 e^{g^2(x^3)+x^6}$$

5. $f(x) = g(g^2(2x))$ donde $g'(x) = \sin(x^2)$

$$f'(x) = g'(g^2(2x)) \bullet 2g(2x) \bullet g'(2x) \bullet 2$$

$$f'(x) = \sin\left((g^2(2x))^2\right) \bullet 2g(2x) \bullet \sin\left((2x)^2\right) \bullet 2$$

$$f'(x) = 4g(2x)\sin(g^4(2x))\sin(4x^2)$$