

The Weekly Rigor

No. 239

“A mathematician is a machine for turning coffee into theorems.”

January 19, 2019

39 Problems in Natural-Log Expansions

(Part 1)

PROBLEMS

For each of the following expressions, take the natural logarithm of it and expand it completely, using the various logarithm rules.

1. $(3x - 7)^4(8x^2 - 1)^3$

2. $x^{\frac{2}{5}}(x^2 + 8)e^{x^2+x}$

3. $\frac{(x+1)^4(x-5)^3}{(x-3)^8}$

4. $\sqrt{\frac{x^2+1}{x+1}}$

5. x^x

6. $x^{\frac{1}{x}}$

7. $x^{\sin x}$

8. $(\sin x)^x$

9. $(\ln x)^x$

10. $x^{\ln x}$

11. $2x^{2x}$

12. $5x^{5x}$

13. $3x^{3x}$

14. $4x^{x^4}$

15. $(3x^4 + 4)^3\sqrt{5x^3 + 1}$

16. $(x^5 + 5)^2\sqrt{2x^2 + 3}$

17. $\frac{(3x^4-2)^5}{(3x^3+4)^2}$

18. $\sqrt{3x^2 + 1}(3x^4 + 1)^3$

19. $\sqrt{x(x+1)}$

20. $\sqrt{(x^2+1)(x-1)^2}$

21. $\sqrt{\frac{t}{t+1}}$

22. $\sqrt{\frac{1}{t(t+1)}}$

23. $\frac{1}{t(t+1)(t+2)}$

24. $\frac{x\sqrt{x^2+1}}{(x+1)^{\frac{2}{3}}}$

25. $\sqrt{\frac{(x+1)^{10}}{(2x+1)^5}}$

26. $(x+1)^x$

27. $x^{(x+1)}$

28. $(\sqrt{t})^t$

29. $t^{\sqrt{t}}$

30. $\left(1 + \frac{r}{n}\right)^{nt}$

31. $\frac{\sqrt{\theta}}{1+\sqrt{\theta}}$

32. $\frac{K^2L}{M+1}$

33. $\frac{K^2L}{M \cdot N}$

34. $x^3y^4\sqrt{z+5}$

35. $\frac{x(3-x^5)^2}{\sqrt[3]{5+3x^4}}$

36. $\frac{\sin^2(x)\cos(x)}{x^5}$

37. $\frac{\sin(2x)\cos(5x)\tan^3(7x)}{\cos^2(3x)}$

38. $(\sin(x))^x$

39. $\left(\frac{\sqrt[x]{a} + \sqrt[x]{b}}{2}\right)^x$

“Only he who never plays, never loses.”