Math Xb Gateway Exam: Algebra and Derivatives - Practice Problems

- *You may not use a calculator on this exam.*
- *Show all of your work. You will be graded on the entire process, not just the final answer.*
- *Unless stated otherwise, simplify and factor all of your answers as much as possible.*

1. Find the derivative of $f(x) = (x^2 + x + 3)^3$.
2. Find the derivative of $f(x) = \sqrt{e^{x^2+x}}$.
3. Find the derivative of $f(x) = (x^{11} + e^x + e^{x^2})^{99}$.
4. Find the derivative of $f(x) = e^{\sqrt{x^7+x+x^{-1}}}$.
5. Find the derivative of $f(x) = (5x^5 + 3x^2 + 1)^{-5}$.
6. Find the derivative of $f(x) = \sqrt{e^{\sqrt{e^x}}}$.
7. Find the derivative of $f(x) = (7x^{99} + 98x)^{1000001}$.
8. Find the derivative of $f(x) = e^{e^{e^x}}$.
9. Find the derivative of $f(x) = (\frac{1}{x} + \frac{1}{x^2})^{-3}$.
10. Find the derivative of $f(x) = \frac{1}{3}(x^4 + x^3 + x^2 + x + 1)^3 + \frac{1}{2}(x^4 + x^3 + x^2 + x + 1)^2 + (x^4 + x^3 + x^2 + x + 1) + e^{x^4+x^3+x^2+x+1} + 1$.

11. Find all solutions to: $\frac{x}{2x+9} < \frac{1}{x+3}$.
12. Find all solutions to: $\frac{x}{x^2+4} < \frac{1}{x-1}$.
13. Find all solutions to: $\frac{6x}{x+2} > -\frac{x+1}{x-1}$.
14. Find all solutions to: $\frac{3x^2+1}{x-1} > 2x$.
15. Find all solutions to: $\frac{x}{x+3} > -\frac{x+6}{2x+1}$.
16. Find all solutions to: $\frac{x^2+1}{x-6} \leq \frac{x}{6}$.
17. Find all solutions to: $\frac{5x}{x^2+x+1} \leq -\frac{1}{3x+5}$.
18. Find all solutions to: $\frac{2x+1}{x-1} \leq \frac{x+1}{2x-1}$.
19. Find all solutions to: $\frac{3x+2}{x+2} \geq \frac{6x-1}{x-6}$.
20. Find all solutions to: $\frac{x+1}{x} \geq -\frac{x}{x+1}$.

21. Find the derivative of $g(x) = (2x+1)^2(5x^8+2x)^3$.

22. Find the derivative of $g(x) = \frac{(5x^4+2x^2+e^x)^9}{(17x^2+x^{-1})^3}$.

23. Find the derivative of $g(x) = (x^4+1)^{-3}(x^5-2)^{-1}$.

24. Find the derivative of $g(x) = (21x^{10}+11x^5+3)^5(x^4+x^2+1)^7$.

25. Find the derivative of $g(x) = \frac{(e^x+e^{x^2})^2}{(e^x+e^{-x})^3}$.

26. Find the derivative of $g(x) = \frac{(x+1)^{99}}{(x-1)^{99}}$.

27. Find the derivative of $g(x) = (5x^6+x^5+2)^7(5x^6+x^5+1)^{-7}$.

28. Find the derivative of $g(x) = (100x^2+9)^{-9}(5x^4-32x+3)^5$.

29. Find the derivative of $g(x) = (x^3+x^2+x+1)^3(e^{3x}+e^{2x}+e^x+1)^{-2}$.

30. Find the derivative of $g(x) = (9x^9+6x^6+3x^3+1)^{-6}(x^2+1)^{-3}$.

31. Find $\frac{dy}{dx}$ if $x+y=xy^2$. You do not need to simplify your answer.

32. Find $\frac{dy}{dx}$ if $xy+y=x$. You do not need to simplify your answer.

33. Find $\frac{dy}{dx}$ if $x^2+xy^2=y$. You do not need to simplify your answer.

34. Find $\frac{dy}{dx}$ if $y+x^9y=x+x^2y$. You do not need to simplify your answer.

35. Find $\frac{dy}{dx}$ if $x+x^2+y=x^3y^2$. You do not need to simplify your answer.

36. Find $\frac{dy}{dx}$ if $x^7+x^8y=xe^y$. You do not need to simplify your answer.

37. Find $\frac{dy}{dx}$ if $e^xy=xe^y$. You do not need to simplify your answer.

38. Find $\frac{dy}{dx}$ if $xy=\frac{x}{x^2+y}$. You do not need to simplify your answer.

39. Find $\frac{dy}{dx}$ if $xy+xy^2+x^2y=0$. You do not need to simplify your answer.

40. Find $\frac{dy}{dx}$ if $y+y^4+1=x$. You do not need to simplify your answer.

41. Solve for x: $x^2 = \frac{x}{2}$.

42. Solve for x: $\frac{4^{x^3}}{6^{x/3}} = 1$.

43. Solve for x: $2^x - 6^{3x} = 0$.

44. Solve for x: $\frac{3^{2x}}{e^{x^2}} = 1$.

45. Solve for x: $\log_2 x^2 - 2\log_2 \sqrt{x-2} = 3$.

46. Solve for x: $\ln 3x^3 - \ln \frac{1}{x^2} = 3$.

47. Solve for x: $\frac{1}{3}\log_5 x^3 - \log_5(x+1) = -1$.

48. Solve for x: $log_6 x + log_6(x+1) = 1$

49. Solve for x: $\log_3 3x - \log_3 2x = 7$.

50. Solve for x: $\log_5 x = \log_7 2x$.