Name:_____

Follow the instructions for each question and show enough of your work so that I can follow your thought process. If I can't read your work or answer, you will receive little or no credit!

Simplify:

1. $(2x + 5)(3x - 7)$

2. $(4x - 3y)(x - 5y)$

3. $(7x-4)(x^3-x^2+6)$

4. $\dfrac{3u^3v^4-2u^5v^2+(u^2v^2)^2}{u^3v^2}$

5. $(\sqrt{x}-\sqrt{y})(\sqrt{x}+\sqrt{y})$

6. $(4x - 3y)(x - 5y)$

7. $(x^{1/3} + y^{1/3})(x^{2/3} - x^{1/3}y^{1/3} + y^{2/3})$

Factor the following polynomials:

8. $8x^2 - 53x - 21$

9. $50x^2 + 45xy - 18y^2$

10. $z^4 - 64w^2$

11. $64x^3 + 27$

12. $125 - 27z^3$

13. $x^4 + 2x^3 - x - 2$

14. $x^4 - 3x^3 + 8x - 24$

15. $6w^8 + 17w^4 + 12$

16. $y^2 + 9 - 6y - 4x^2$

Simplify the following expressions:

17. $\dfrac{2x^2 + 9x - 5}{3x^2 + 17x + 10}$

18. $\dfrac{4x^2 - 9}{2x^2 + 7x + 6} \cdot \dfrac{4x^4 + 6x^3 + 9x^2}{27x^4 + 8x}$

19. $\dfrac{5a^2 + 12a + 4}{a^4 - 16} \div \dfrac{25a^2 + 20a + 4}{a^2 - 2a}$

20. $\dfrac{t}{t+3} + \dfrac{4t}{t-3} - \dfrac{18}{t^2-9}$

21. $4 + \dfrac{2}{u} - \dfrac{3u}{u+5}$

22. $\dfrac{\frac{1}{x+2} - 3}{\frac{4}{x} - x}$

23. $\dfrac{y^{-2} - x^{-2}}{y^{-2} + x^{-2}}$

24. $\dfrac{y^{-1} + x^{-1}}{(xy)^{-1}}$

Solve the following equations:

25. $6x^2 + x - 12 = 0$

26. $15x^2 - 14 = 29x$

27. $x(3x + 10) = 77$

28. $\dfrac{2x}{x+3} + \dfrac{5}{x} - 4 = \dfrac{18}{x^2+3x}$

29. $\dfrac{3x}{x-2} + \dfrac{1}{x+2} = \dfrac{-4}{x^2-4}$

30. $x^2 + 6x + 7 = 0$, complete the square here

31. $4x^2 + 20x + 13 = 0$, complete the square here

32. $6x^2 - x = 2$

33. $x^2 + x + 1 = 0$

34. $x^4 + x^2 = -1$

35. $x^2 - 6x - 3 = 0$

36. $\frac{1}{7}x^2 + 1 = \frac{4}{7}x$

37. $12x^2 - 16x = 3$

Sketch the following graphs:

38. $2x + 3y = 5$

39. $y = 2x^2 - 1$

40. $y = 3x + 2$

41. $y = -x^2 + 3$

Given the indicated functions, find their domains:

42. $f(x) = \sqrt{9 - x^2}$

43. $f(x) = \dfrac{x + 1}{x^3 - 4x}$

44. $f(x) = \sqrt{x^2 - 25}$

45. $\dfrac{4x}{6x^2 + 13x - 5}$

46. $f(x) = \dfrac{1}{(x-3)\sqrt{x+3}}$

Given the indicated functions, $f(x)$ and $g(x)$, find their compositions, $(f \circ g)(x)$ and $(g \circ f)(x)$. Also find their new domains:

47. $f(x) = \dfrac{x}{x-2}, \quad g(x) = \dfrac{3}{x}$

48. $f(x) = \dfrac{x-1}{x-2}, \quad g(x) = \dfrac{x-3}{x-4}$

49. Find the equation of the line parallel to the line $5x - 2y = 4$ through the point $A = (-1, 6)$.

50. Find the equation of the line perpendicular to the line $x + 3y = 1$ through the point $A = (-3, 5)$.

51. Find the equation of the line with slope $m = 5$ through the point $A = (2, 4)$.

52. Find the equation of the line through the points $A = (1, 4)$ and $B = (3, 9)$.

53. Given the function $f(x) = 3x^2 + 7x + 2$, find the following quantity and simplify it,
$$\frac{f(x) - f(a)}{x - a}$$

54. After simplifying the previous problem, evaluate the expression at $x = a$.

55. Given the function $f(x) = x^3$, find the following quantity and simplify it, $\dfrac{f(x) - f(a)}{x - a}$

56. After simplifying the previous problem, evaluate the expression at $x = a$.

Write the following expressions as one logarithm:

57. $2\log\dfrac{y^3}{x} - 3\log y + \dfrac{1}{2}\log x^4y^2$

58. $2\ln x - 4\ln\left(\dfrac{1}{y}\right) - 3\ln(xy)$

59. $\log(x^3y^2) - 2\log x\sqrt[3]{y} - 3\log\left(\dfrac{x}{y}\right)$

Solve the following equations (find the exact answer, no calculator approximations):

60. $\ln(x+3)+\ln(x+5)=1$

61. $\log(x+3)=1-\log(x-2)$

62. $\log_3(x-2)=\log_3 27-\log_3(x-4)-5^{\log_5 1}$

Sketch the following graphs of the functions:

63. $f(x) = e^{2x} + 1$

64. $f(x) = \log_2(4 - x)$