

Name: _____ Date: _____ A2 CC
Unit #4 – Exponential Review Period: _____

Simplify by rewriting without a negative and radical sign.

Simplify answers without a negative, fractional, or decimal exponent.

1. $a^3 \bullet a^0$ 2. $x^{6n} \bullet x^{3n}$ 3. $y^{-3} \bullet y^4$ 4. $(x^{-4})(2x^2)$

16. $\sqrt{25x^6y^3}$

17. $\sqrt{12x^8y^7}$

18. $\sqrt{32x^3y^2z^{10}}$

19. $\sqrt[3]{24}$

20. $\sqrt[3]{54}$

21. $\sqrt[3]{16x^6y^3}$

5. $\frac{a^{-3}}{a^2}$

6. $\frac{15x^4}{3x^9}$

7. $\frac{4x^2}{x^{-5}}$

8. $\frac{x^5y^6}{3x^8y^2}$

22. $\sqrt[3]{x^3y^8}$

23. $\sqrt[3]{27x^7y^9}$

24. $\sqrt[3]{32x^2y^6z^4}$

9. $(4x^2)^3$

10. $\left(\frac{1}{3}x^3\right)^3$

11. $\left(\frac{x}{y}\right)^4$

12. $\left(\frac{x^6}{y^9}\right)^{\frac{1}{3}}$

25. $\left(\sqrt[5]{x^3}\right)\left(x^{\frac{1}{2}}\right)$

26. $\left(x^{\frac{-1}{2}}\right)\left(\sqrt{x^3}\right)$

27. $(y^{-3})\sqrt[6]{y^5}$

13. $\frac{(2x)^3}{2x^2}$

14. $\frac{32x^{-2}}{(2x)^4}$

15. $\left(\frac{x^{-4}}{y^6}\right)\left(\frac{x}{y}\right)^4$

28. $\left(\sqrt[5]{x^4}\right)\left(x^{\frac{-3}{2}}\right)$

29. $\left(\sqrt[6]{x}\right)\left(x^{\frac{7}{2}}\right)$

30. $\left(\sqrt[4]{x^3}\right)\left(x^{\frac{-5}{2}}\right)$

Write the expression using a radical sign simplify if possible:

31. $x^{\frac{4}{7}}$

32. $x^{\frac{5}{3}}$

33. $5x^{\frac{7}{2}}$

34. $6x^{\frac{9}{4}}$

35. $(8x^9)^{\frac{1}{3}}$

36. $(36y^8)^{\frac{1}{2}}$

Write an exponential equation in the form $f(x) = a(b)^x$ that passes through the points:

49. (-4, .0064) and (2, 100)

50. $f(-4) = 48$ and $f(3) = .375$

Write the expression without a negative exponent and using a radical sign:

37. $x^{-\frac{3}{4}}$

38. $ab^{\frac{-2}{5}}$

39. $5y^{\frac{-1}{2}}$

Solve the following for x:

40. $5^{5x+1} = 25^{x+2}$

41. $27^{6-x} = 9^{x-1}$

42. $4^{2x-1} = 8^{2x}$

43. $27 = \left(\frac{1}{3}\right)^{x+1}$

44. $25^{2-x} = \left(\frac{1}{5}\right)^{5x+2}$

45. $\left(\frac{1}{3}\right)^{3-x} = 27^{x+3}$

46. $3^{2x-1} = 3^{x^2}$

47. $2^{x^2-7} = 8^{2x}$

48. $\left(\frac{1}{27}\right)^x = 3^{x^2-10}$

- For 53 – 56.
- Algebraically, find y – intercept.
 - State the equation of the asymptote.
 - State the domain and range of each function in interval notation.
 - Describe any transformational shifts.
 - Is the exponential function growth or decay? Explain.
 - Sketch the graphs of the equations below.

53. $f(x) = 12\left(\frac{1}{3}\right)^x$

54. $f(x) = 5(2)^x$

55. $f(x) = 4\left(\frac{1}{2}\right)^x - 3$

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

51. (-1, .125) and (7, 32)

52. $f(-3) = 128$ and $f(-5) = 2048$

Simplify answers without a negative, fractional, or decimal exponent.

1. $a^3 \cdot a^0$

a^3

2. $x^{6n} \cdot x^{3n}$

x^{9n}

3. $y^{-3} \cdot y^4$

$y^{-4} = \frac{1}{y^4} = \frac{1}{y^4 | 1 |}$
 $\frac{1}{y^4} \cdot y^4 = \frac{y^4}{y^4} = 1$

4. $(x^{-4})(2x^2)$

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

16. $\sqrt{25x^6y^3}$

$\sqrt{5 \cdot 5 \cdot x^2 \cdot x^2 \cdot y^2 \cdot y}$
 $5x^2y\sqrt{y}$

17. $\sqrt{12x^8y^7}$

$\sqrt{4 \cdot 3 \cdot x^4 \cdot x^4 \cdot y^6 \cdot y}$
 $2x^4y^3\sqrt{3y}$

18. $\sqrt{32x^3y^2z^{10}}$

$\sqrt{16 \cdot 2 \cdot x^2 \cdot x \cdot y^2 \cdot z^8 \cdot z^2}$
 $4xyz^5\sqrt{2x}$

19. $\sqrt[3]{24}$

$\sqrt[3]{8 \cdot 3}$
 $2\sqrt[3]{3}$

20. $\sqrt[3]{54}$

$\sqrt[3]{27 \cdot 2}$
 $3\sqrt[3]{2}$

21. $\sqrt[3]{16x^6y^5}$

$\sqrt[3]{8 \cdot 2 \cdot x^4 \cdot y^3 \cdot y^2}$
 $2x^2y^2\sqrt[3]{2y^2}$

5. $a^{-3} \cdot \frac{a^2}{a^2}$

$\frac{a^{-5}}{1} = \frac{1}{a^5}$

6. $\frac{15x^4}{3x^9}$

$\frac{5x^{-5}}{1} = \frac{5}{x^5}$

7. $\frac{4x^2}{x^{-5}}$

$4x^7$

8. $\frac{x^5y^6}{3x^8y^2}$

$\frac{1x^{-3}y^4}{3} = \frac{y^4}{3x^3}$

22. $\sqrt[3]{x^3y^8}$

$\sqrt[3]{x \cdot x^2 \cdot y^6 \cdot y^2}$
 $xy^2\sqrt[3]{y^2}$

23. $\sqrt[3]{27x^7y^9}$

$\sqrt[3]{27 \cdot x^6 \cdot x \cdot y^9}$
 $3x^2y^3\sqrt[3]{x}$

24. $\sqrt[3]{32x^2y^6z^4}$

$\sqrt[3]{8 \cdot 4 \cdot x^2 \cdot y^3 \cdot y^3 \cdot z^3 \cdot z}$
 $2yz^2\sqrt[3]{4x^2z}$

9. $(4x^2)^3$

$\frac{4^3x^6}{1} = \frac{64x^6}{1}$

10. $(\frac{1}{3}x^3)^9$

$(\frac{1}{3})^9 x^9 = \frac{1}{27}x^9$

11. $(\frac{x^1}{y^1})^4$

$\frac{x^4}{y^4} = \frac{y^4}{y^4} = \frac{4}{4}$

12. $(\frac{x^6}{y^9})^3$

$\frac{x^2}{y^3}$

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

$(x^{\frac{3}{2}})(x^{\frac{1}{2}})$
 $x^{\frac{3}{2} + \frac{1}{2}} = x^2$
 $x^{\frac{10}{10}} = \sqrt{10}x^1 = \frac{10x}{x} = 10$

26. $(x^{\frac{-1}{2}})(\sqrt{x^3})$

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

27. $(y^{-3})(y^{\frac{5}{2}})$

$(y^{-\frac{6}{2}})(y^{\frac{5}{2}})$
 $y^{-\frac{6}{2} + \frac{5}{2}} = y^{-\frac{1}{2}} = \frac{1}{y^{\frac{1}{2}}} = \frac{1}{\sqrt{y}}$
 $\frac{1}{\sqrt{y}} = \frac{1}{\sqrt{13y}} = \frac{1}{\sqrt{13} \cdot \sqrt{y}}$

13. $(\frac{2x^3}{2x^2})^3$

$\frac{2^3x^9}{2x^6} = \frac{8x^3}{2x^6} = \frac{4x^{-3}}{1} = \frac{1}{4x^3}$

14. $\frac{32x^{-2}}{(2x^4)^4}$

$\frac{32x^{-2}}{2^4x^{16}} = \frac{32x^{-2}}{16x^{16}} = \frac{2x^{-18}}{1} = \frac{2}{x^{18}}$

15. $(\frac{x^{-4}}{y^6})(\frac{x^1}{y^1})^4$

$(\frac{x^{-4}}{y^6})(\frac{x^4}{y^4}) = \frac{x^0}{y^{10}} = \frac{1}{y^{10}}$

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

$(x^{\frac{4}{3}})(x^{-\frac{3}{2}})$
 $x^{\frac{4}{3} - \frac{3}{2}} = x^{\frac{8}{6} - \frac{9}{6}} = x^{-\frac{1}{6}} = \frac{1}{x^{\frac{1}{6}}}$

29. $(\sqrt[6]{x})(x^{\frac{7}{2}})$

$(x^{\frac{1}{6}})(x^{\frac{7}{2}})$
 $x^{\frac{1}{6} + \frac{7}{2}} = x^{\frac{1}{6} + \frac{21}{6}} = x^{\frac{22}{6}} = \sqrt[3]{x^{\frac{11}{3}}}$

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

$(x^{\frac{3}{4}})(x^{-\frac{5}{2}})$
 $x^{\frac{3}{4} - \frac{5}{2}} = x^{\frac{3}{4} - \frac{10}{4}} = x^{-\frac{7}{4}} = \frac{1}{x^{\frac{7}{4}}}$
 $\frac{1}{x^{\frac{7}{4}}} = \frac{1}{\sqrt[4]{x^7}} = \frac{1}{\sqrt[4]{x^4 \cdot x^3}} = \frac{1}{x\sqrt[4]{x^3}}$

Write the expression using a radical sign simplify if possible:

31. $x^7 \sqrt[4]{x^4}$

34. $6x^4 \sqrt[9]{6^4 x^9}$
 $\sqrt[9]{6^4 x^9}$
 $\sqrt[9]{6^4 x^9}$
 $\sqrt[9]{6^4 x^9}$

32. $x^3 \sqrt[5]{x^5}$
 $\sqrt[5]{x^5}$
 $\sqrt[5]{x^5}$
 $\sqrt[5]{x^5}$

33. $5x^2 \sqrt[7]{5^2 x^7}$
 $\sqrt[7]{5^2 x^7}$
 $\sqrt[7]{5^2 x^7}$
 $\sqrt[7]{5^2 x^7}$

35. $(8x^9)^{\frac{1}{3}}$
 $\sqrt[3]{8x^9}$
 $\sqrt[3]{8x^9}$
 $\sqrt[3]{8x^9}$

36. $(36y^8)^{\frac{1}{2}}$
 $\sqrt{36y^8}$
 $\sqrt{36y^8}$
 $\sqrt{36y^8}$

Write the expression without a negative exponent and using a radical sign:

37. $x^{\frac{4}{3}} \sqrt[3]{\frac{1}{x^{\frac{1}{3}}}}$
 $\sqrt[3]{\frac{1}{x^{\frac{1}{3}}}}$
 $\sqrt[3]{\frac{1}{x^{\frac{1}{3}}}}$

38. $\frac{ab^{\frac{2}{3}}}{\sqrt[3]{b^{\frac{2}{3}}}}$
 $\sqrt[3]{\frac{a}{b^2}}$
 $\sqrt[3]{\frac{a}{b^2}}$

39. $\sqrt[4]{5y^{\frac{1}{2}}}$
 $\sqrt[4]{5y^{\frac{1}{2}}}$
 $\sqrt[4]{5y^{\frac{1}{2}}}$

Write an exponential equation in the form $f(x) = a(b)^x$ that passes through the points:

49. $(-4, .0064)$ and $(2, 100)$

$100 = a(b)^2$
 $.0064 = a(b)^{-4}$
 $\frac{100}{.0064} = \frac{a(b)^2}{a(b)^{-4}}$
 $15625 = b^6$
 $b = 5$
 $100 = a(5)^2$
 $4 = a$
 $y = 4(5)^x$

50. $f(-4) = 48$ and $f(3) = .375$

$48 = a(b)^{-4}$
 $.375 = a(b)^3$
 $\frac{48}{.375} = \frac{a(b)^{-4}}{a(b)^3}$
 $128 = b^{-7}$
 $\frac{1}{b} = b$
 $b = 1$
 $.375 = a(1)^3$
 $.375 = a$
 $y = 3(\frac{1}{2})^x$

51. $(-1, .125)$ and $(7, 32)$

$32 = a(b)^7$
 $.125 = a(b)^{-1}$
 $\frac{32}{.125} = \frac{a(b)^7}{a(b)^{-1}}$
 $256 = b^8$
 $b = 2$
 $32 = a(2)^7$
 $1 = a$
 $y = \frac{1}{4}(2)^x$

52. $f(-3) = 128$ and $f(5) = 2048$

$128 = a(b)^{-3}$
 $2048 = a(b)^5$
 $\frac{2048}{128} = \frac{a(b)^5}{a(b)^{-3}}$
 $16 = b^8$
 $b = 2$
 $128 = a(2)^{-3}$
 $16 = a$
 $y = 2(1.25)^x$

Solve the following for x:

40. $5^{5x+1} = 25^{x+2}$
 $5^{5x+1} = 5^2 x + 2$
 $5x + 1 = 2x + 4$
 $3x + 1 = 4$
 $3x = 3$
 $x = 1$

41. $27^{6-x} = 9^{x-1}$
 $(3^3)^{6-x} = (3^2)^{x-1}$
 $3^{18-3x} = 3^{2x-2}$
 $18-3x = 2x-2$
 $18 = 5x-2$
 $20 = 5x$
 $x = 4$

42. $4^{2x-1} = 8^{2x}$
 $(2^2)^{2x-1} = (2^3)^{2x}$
 $2^{4x-2} = 2^{6x}$
 $4x-2 = 6x$
 $-2 = 2x$
 $x = -1$

43. $27 = (\frac{1}{3})^{x+1}$
 $3^3 = (3^{-1})^{x+1}$
 $3 = -1x + 1$
 $4 = -1x$
 $-4 = x$

44. $25^{2-x} = (1/5)^{5x+2}$
 $(5^2)^{2-x} = (5^{-1})^{5x+2}$
 $4-2x = -5x-1$
 $4+5x = -5x-1$
 $4+3x = -4$
 $3x = -8$
 $x = -2$

45. $(\frac{1}{3})^{3-x} = 27^{x+3}$
 $(3^{-1})^{3-x} = (3^3)^{x+3}$
 $-3+x = 3x+9$
 $-3+2x = 9$
 $-12 = 2x$
 $x = -6$

46. $3^{2x-1} = 3^{x^2}$
 $2x-1 = x^2$
 $0 = x^2 - 2x + 1$
 $0 = (x-1)(x-1)$
 $x = 1$

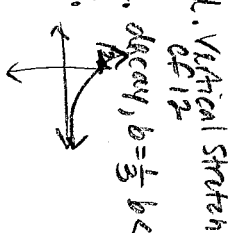
47. $2^{x^2-7} = 8^{2x}$
 $2^{x^2-7} = (2^3)^{2x}$
 $x^2-7 = 4x$
 $x^2-4x-7 = 0$
 $(x-7)(x+1) = 0$
 $x = 7$ or $x = -1$

48. $(\frac{1}{27})^x = 3^{x^2-10}$
 $(3^{-3})^x = 3^{x^2-10}$
 $-3x = x^2-10$
 $0 = x^2+3x-10$
 $0 = (x+5)(x-2)$
 $x = -5$ or $x = 2$

- For 53 - 56.
 a. Algebraically, find y - intercept.
 b. State the equation of the asymptote.
 c. State the domain and range of each function in interval notation.
 d. Describe any transformational shifts.
 e. Is the exponential function growth or decay? Explain.
 f. Sketch the graphs of the equations below.

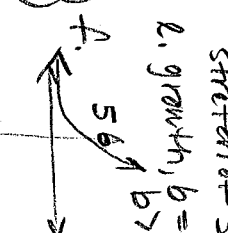
53. $f(x) = 12(\frac{1}{3})^x$

a. Vertical stretch
 b. decay, $b = \frac{1}{3}$ $b < 1$



54. $f(x) = 5(2)^x$

a. Vertical stretch of 5
 b. growth, $b = 2$



55. $f(x) = 4(\frac{1}{2})^x - 3$

a. Vertical stretch of 4, down 3
 b. decay, $b = \frac{1}{2}$ $b < 1$

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

a. Vertical stretch of 4, up 2
 b. growth, $b = 3$



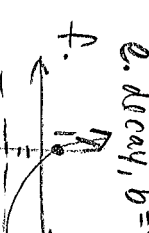
a. $y = 4(\frac{1}{2})^x - 3$

d. Vertical stretch of 4, down 3

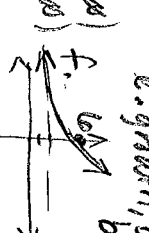
a. $y = 4(3)^x + 2$

d. Vertical stretch of 4, up 2

b. $y = -3$



c. d.: $(-∞, ∞)$



f. $(-3, ∞)$