★ U6 Review ★

1. $6^3 = 216$
   $\log_6 216 = 3$

2. $7^2 = 49$
   $\log_7 49 = 2$

3. $\log_3 9 = 2$
   $3^2 = 9$

4. $\ln 7 = 1.946$
   $e^{1.946} = 7$

5. $\log_3 \left(\frac{u^3}{v}\right)^2$
   $2\log_3 \left(\frac{u^3}{v}\right)$
   $2\log_3 u^3 - 2\log_3 v$
   $\boxed{6\log_3 u - 2\log_3 v}$

6. $\log \sqrt[3]{\frac{x}{y^6 z^9}}$
   $\frac{1}{3}\log \frac{x}{y^6 z^9}$
   $\frac{1}{3}\log x - \frac{1}{3}\log y^6 z^9$
   $\frac{1}{3}\log x - \left(\frac{1}{3}\log y^6 + \frac{1}{3}\log z^9\right)$
   $\frac{1}{3}\log x - \frac{1}{3}\log y^6 - \frac{1}{3}\log z^9$
   $\boxed{\frac{1}{3}\log x - 2\log y - 3\log z}$

7. $8\log_3 12 + 2\log_3 5$
   $\log_3 12^8 + \log_3 5^2$
   $\boxed{\log_3 12^8 \cdot 5^2}$

8. $3\ln x + 2\ln y - \ln(x-1) - 2\ln z$
   $\ln x^3 + \ln y^2 - \ln(x-1) - \ln z^2$
   $\boxed{\ln\left(\frac{x^3 y^2}{(x-1)z^2}\right)}$

9. $\log_2 8 = x$ or $\log_2 2^3 = \boxed{3}$
   $2^x = 8$
   $\boxed{x = 3}$

10. $\log 56$ $\boxed{\approx 1.748}$

11. $\ln 12$ $\boxed{\approx 2.485}$

12. $\log_4 0.25$ or $\log_4 0.25 = x$
    $\log_4 \left(\frac{1}{4}\right)$ $4^x = 0.25$
    $\log_4 4^{-1}$ $4^x = \frac{1}{4}$
    $\boxed{-1}$ $4^x = 4^{-1}$
    $\boxed{x = -1}$

13. $\log_9 x = 2$
    $9^2 = x$
    $\boxed{81 = x}$

14. $\log_3 (2x+7) = 4$
    $3^4 = 2x + 7$
    $81 = 2x + 7$
    $74 = 2x$
    $\boxed{37 = x}$

15. $\log_x 16 = 2$
    $x^2 = 16$
    $\boxed{x = 4}$

16. $\log_8(6x-4) = \log_8(2x+12)$

$6x-4 = 2x+12$

$4x-4 = 12$

$4x = 16$

$\boxed{x = 4}$

17. $\ln(x+1) = 9$

$e^9 = x+1$

$e^9 - 1 = x$

$\boxed{x = 8102.084}$

18. $\ln(2x-8) = 3$

$e^3 = 2x-8$

$e^3 + 8 = 2x$

$\frac{e^3+8}{2} = x$

$\boxed{x = 14.043}$

19. $\log_4 3x^2 + \log_4 2x = 4$

$\log_4(3x^2 \cdot 2x) = 4$

$\log_4(6x^3) = 4$

$4^4 = 6x^3$

$256 = 6x^3$

$\frac{128}{3} = x^3$

$x = \sqrt[3]{\frac{128}{3}}$

$\boxed{x \approx 3.494}$

20. $\log x^2 - \log 3x = 2$

$\log\left(\frac{x^2}{3x}\right) = 2$

$\log\left(\frac{x}{3}\right) = 2$

$10^2 = \frac{x}{3}$

$100 = \frac{x}{3}$

$\boxed{x = 300}$

21. $5^x = 22$

$\ln 5^x = \ln 22$

$x \cdot \ln 5 = \ln 22$

$x = \frac{\ln 22}{\ln 5}$ $\boxed{\approx 1.921}$

22. $3^{2x} - 6 = 17$

$3^{2x} = 23$

$\ln 3^{2x} = \ln 23$

$(2x)(\ln 3) = \ln 23$

$x = \frac{\ln 23}{2\ln 3}$ $\boxed{\approx 1.427}$

23. $2 \cdot 9^x = 100$

$9^x = 50$

$\ln 9^x = \ln 50$

$x \ln 9 = \ln 50$

$x = \frac{\ln 50}{\ln 9}$ $\boxed{\approx 1.780}$

24. $e^{3x} = 11$

$\ln e^{3x} = \ln 11$

$3x = \ln 11$

$x = \frac{1}{3}\ln 11$

$\boxed{x \approx 0.799}$

25. $7^{x+3} = 40$

$\ln 7^{(x+3)} = \ln 40$

$(x+3)\ln 7 = \ln 40$

$x + 3 = \frac{\ln 40}{\ln 7}$

$x = \frac{\ln 40}{\ln 7} - 3$ $\boxed{\approx -1.104}$

26. $10^x = 4^{2x-3}$

$\ln 10^x = \ln 4^{2x-3}$

$x \ln 10 = (2x-3)\ln 4$

$x \ln 10 = 2x \ln 4 - 3 \ln 4$

$x \ln 10 - 2x \ln 4 = -3 \ln 4$

$x(\ln 10 - 2\ln 4) = -3\ln 4$

$x = \dfrac{-3\ln 4}{\ln 10 - 2\ln 4}$ ≈ 8.849

27. $A = P(2)^t$

$A = 180(2)^9$

$A = 92160$ bacteria

28. $r = 10\% = 0.1$

$P = 3$

$A = 10$

$10 = 3(1.1)^t$

$\frac{10}{3} = 1.1^t$

$\ln\left(\frac{10}{3}\right) = \ln 1.1^t$

$\ln\left(\frac{10}{3}\right) = t \ln 1.1$

$t = \dfrac{\ln\left(\frac{10}{3}\right)}{\ln(1.1)}$ ≈ 12.632 years

29. $r = 0.04$ $A = 25.25$ $t = 50$

$25.25 = P(1.04)^{50}$

$P = \dfrac{25.25}{(1.04)^{50}} \approx 3.553$ \$3.55

30. $A = 10(3)^8 =$ 65,610 zombies

31. $90 = 300(1 - 0.06)^t$

$90 = 300(0.94)^t$

$\frac{3}{10} = 0.94^t$

$\ln\left(\frac{3}{10}\right) = \ln(0.94^t)$

$\ln\left(\frac{3}{10}\right) = t \ln(0.94)$

$t = \dfrac{\ln\left(\frac{3}{10}\right)}{\ln(0.94)}$ ≈ 19.458 years

32. $A = Pe^{rt}$

$A = 400e^{(0.03)(7)} \approx 493.471$ \$493.47

33. $1200 = 600\left(1 + \frac{0.04}{12}\right)^{12t}$

$2 = (1.0033333)^{12t}$

$\ln 2 = \ln(1.0033333)^{12t}$

$\ln 2 = 12t \ln(1.0033333)$

$t = \dfrac{\ln 2}{12\ln(1.0033333)}$ ≈ 17.358 years

34. $50000 = P\left(1 + \frac{0.065}{4}\right)^{4 \cdot 7}$

$50000 = P(1.016625)^{28}$

$P = \dfrac{50000}{(1.016625)^{28}}$ ≈ 31838.629 years

35. $1400 = 900e^{0.07t}$

$\frac{14}{9} = e^{0.07t}$

$\ln\left(\frac{14}{9}\right) = \ln e^{0.07t}$

$\ln\left(\frac{14}{9}\right) = 0.07t$

$t = \dfrac{\ln\left(\frac{14}{9}\right)}{0.07}$ ≈ 6.312 years

$f(x) = 2x-5 \quad g(x) = x^2-3x+6$

36. $(f+g)(x) = (2x-5)+(x^2-3x+6) = \boxed{x^2-x+1}$

37. $(g-f)(x) = (x^2-3x+6)-(2x-5) = \boxed{x^2-5x+11}$

38. $(fg)(x) = (2x-5)(x^2-3x+6)$

$2x^3-6x^2+12x-5x^2+15x-30 = \boxed{2x^3-11x^2+27x-30}$

39. $\left(\frac{f}{g}\right)(x) = \boxed{\frac{2x-5}{x^3-3x+6}}$

40. $(f+g)(2) = (2)^2-2+1 = \boxed{3}$

41. $(f-g)(3) = (2\cdot 3-5)-(3^2-3\cdot 3+6) = (1)-(6) = \boxed{-5}$

42. $(fg)(-2) = 2(-2)^3-11(-2)^2+27(-2)-30 = \boxed{-144}$

43. $\left(\frac{g}{f}\right)(6) = \frac{(6)^2-3(6)+6}{2(6)-5} = \boxed{\frac{24}{7}}$

44. $(f\circ g)(3)$

$f(g(3))$

$f(3^2-3\cdot 3+6)$

$f(6) = 2(6)-5 = \boxed{7}$

45. $(g\circ f)(-2) = g(f(-2))$

$g(2\cdot -2-5)$

$g(-9) = (-9)^2-3(-9)+6 = \boxed{114}$

46. $f(g(x)) = f(x^2-3x+6) =$

$2(x^2-3x+6)-5$

$2x^2-6x+12-5$

$\boxed{2x^2-6x+7}$

OOPS bb :)

49. $g(f(x)) = g(2x-5) =$

$(2x-5)^2-3(2x-5)+6$

$(2x-5)(2x-5)-6x+15+6$

$4x^2-10x-10x+25-6x+15+6$

$\boxed{4x^2-26x+46}$

50. $\{(6,-5),(-1,0),(4,7)\}$

51. $f(x) = 4x - 16$

$y = 4x - 16$

$x = 4y - 16$

$x + 16 = 4y$

$y = \frac{1}{4}(x + 16)$

$\boxed{f^{-1}(x) = \frac{1}{4}x + 4}$

52. $f(x) = (3x-11)^2$

$y = (3x-11)^2$

$x = (3y-11)^2$

$\pm\sqrt{x} = 3y - 11$

$11 \pm \sqrt{x} = 3y$

$y = \frac{1}{3}(11 \pm \sqrt{x})$

but you must restrict the domain so

$\boxed{f^{-1}(x) = \frac{1}{3}(11 + \sqrt{x})}$

53. $f(x) = \frac{5x+6}{3} \qquad x = \frac{5y+6}{3}$

$3x = 5y + 6$

$3x - 6 = 5y$

$\boxed{y = \frac{1}{5}(3x-6)}$

54. $y = \frac{7x+5}{2x-9} \qquad x = \frac{7y+5}{2y-9}$

$(2y-9)x = 7y + 5$

$2xy - 9x = 7y + 5$

$2xy - 7y = 5 + 9x$

$y(2x-7) = 9x + 5$

$y = \frac{9x+5}{2x-7}$

$\boxed{f^{-1}(x) = \frac{9x+5}{2x-7}}$

55. $f(x) = \log_2(x+5) - 9$

$x = \log_2(y+5) - 9$

$x + 9 = \log_2(y+5)$

$2^{x+9} = y + 5$

$\boxed{y = 2^{x+9} - 5}$