Unit 6 Project

1. $3^7 = 2187$

$\log_3 2187 = 7$

2. $\log_8 16 = \frac{4}{3}$

$\Rightarrow 8^{\frac{4}{3}} = 16$

3. $\log_3 5 = x$

$3^x = 5$

$\log 3^x = 5$

$x \log 3 = \log 5$

$x = \dfrac{\log 5}{\log 3} = 1.464974$

$x \approx 1.4650$

4. $\log_2 \frac{1}{64}$

$= \log_2 64^{-1}$

$= \log_2 2^{-6}$

$= -6 \log_2 2$

$= -6$

64
2 ∧ 32
2 ∧ 16
2 ∧ 8
2 ∧ 4
2 ∧ 2
2 ∧ 1

5. $\log_4 21 = \log_4 (7 \times 3)$

$\begin{array}{r} 1.4037 \\ 0.7925 \\ \hline 2.1962 \end{array}$

$= \log_4 7 + \log_4 3$

$= 1.4037 + 0.7925$

$= 2.1962$

6. $\log_4 \left(\frac{7}{12} \right)$

$= \log_4 7 - \log_4 12$

$= \log_4 7 - \log_4 (4 \times 3)$

$= \log_4 7 - \log_4 4 - \log_4 3$

$= 1.4037 - 1 - 0.7925$

$= -0.3888$

7. $27^{2p+1} = 3^{4p-1}$

$3^{3(2p+1)} = 3^{4p-1}$

$3(2p+1) = 4p-1$

$6p + 3 = 4p - 1$

$6p - 4p = -1 - 3$

$2p = -4$

$p = -2$

8. $\log_m 144 = -2$

$m^{-2} = 144$

$\left(\frac{1}{m} \right)^2 = 144$

$\frac{1}{m} = \pm 12$

$m = \frac{1}{12}$ or $-\frac{1}{12}$

positive $(x > 0)$

$\therefore m = \frac{1}{12}$

x+5 = 11

$e^{3*} = 6.$

$e^{3x} = 3.$

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

$3x = \ln 3$

$x = \dfrac{\ln 3}{3} = 0.36620$

$x \simeq 0.3662.$

$\log_q(x+4) + \log_q(x-4) = 1$

$\log_q (x+4)(x-4) = \log_q 9$

$(x+4)(x-4) = 9$

$x^2 - 16 = 9$

$x^2 = 9+16$

$x^2 = 25$

$x = \sqrt{25}$

$x = \pm 5.$

∴ x = -5 or 5.

positive (x>0).

∴ x = 5.

11. $\log_2 x < 7$

$2^7 < x$

128 < x and x > 0.

0 < x < 128.

12. $A = P\left(1+\dfrac{r}{100}\right)^n.$

$A = 20\left(1+\dfrac{3.5}{100}\right)^{15}$

A = $33.51.

13. $40 = 20\left(1+\dfrac{3.5}{100}\right)^n$

$2 = (1.035)^n.$

$n \log 1.035 = \log 2$

$n = \dfrac{\log 2}{\log 1.035} = 20.149.$

$n \simeq 21$ years.

14. $y = ae^{-0.0856t}$

$\dfrac{1}{2} = 1e^{-0.0856t}.$

$0.5 = e^{-0.0856t}.$

$\ln 0.5 = \ln e^{-0.0856t}$

$-0.0856t = \ln 0.5$

$t = \dfrac{\ln 0.5}{-0.0856t}$

$t = 8.09751$

$t \simeq 8$ days.