# 7.3 Corrective Assignment



***Solve, rounding to three significant digits.***

1. $8^{-x} = 0.654$

$\log_8 8^{-x} = \log_8 0.654$

$-x = \frac{\log 0.654}{\log 8}$

$x = \frac{-\log 0.654}{\log 8}$

$x \approx 0.204$

2. $10^{x-4} = 92$

$\log 10^{x-4} = \log 92$

$x - 4 = \log 92$

$x = 4 + \log 92$

$x \approx 5.964$

3. $e^x = 8.88$

$\ln e^x = \ln 8.88$

$x = \ln 8.88$

$x \approx 2.184$

4. $15e^{2x-1} = 272$

$e^{2x-1} = \frac{272}{15}$

$\ln e^{2x-1} = \ln \frac{272}{15}$

$2x - 1 = \ln \frac{272}{15}$

$2x = 1 + \ln \frac{272}{15}$

$x = \frac{1}{2} + \frac{1}{2}\ln \frac{272}{15}$

$x \approx 1.949$

5. $\log_8 x = 2$

$8^2 = x$

$64 = x$

6. $e^{0.045x} + 105 = 240$

$e^{0.045x} = 135$

$\ln e^{0.045x} = \ln 135$

$0.045x = \ln 135$

$x = \frac{\ln 135}{0.045}$

$x \approx 109.006$

7. $\log x + \log 10 = 2$

$\log x + 1 = 2$

$\log x = 1$

$10^{\log x} = 10^1$

$x = 10$

8. $\log(x+4) + \log(x) = 1$

check for extraneous solutions!

$\log(x^2+4x) = 1$

$10^{\log(x^2+4x)} = 10^1$

$x^2 + 4x = 10$

$x^2 + 4x - 10 = 0$

$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$

$x = \frac{-(4) \pm \sqrt{(4)^2-4(1)(-10)}}{2(1)}$

$x = \frac{-4 \pm \sqrt{16+40}}{2}$

$x = \frac{-4 \pm \sqrt{56}}{2}$

$x = \frac{-4 \pm 2\sqrt{14}}{2}$

$x = -2 + \sqrt{14}$, $x \neq -2 - \sqrt{14}$ Neg Argument

$x \approx 1.742$

9. $\log(15 - 2x) = \log(3x - 20)$

$15 - 2x = 3x - 20$

$15 = 5x - 20$

$35 = 5x$

$7 = x$

10. $5 - \log(x+2) = 7$

$-\log(x+2) = 2$

$\log(x+2) = -2$

$10^{-2} = x + 2$

$\frac{1}{100} = x + 2$

$-2 + \frac{1}{100} = x$

$-1.990 = x$

11. $5^{x+1} = 17$

$\log_5 5^{x+1} = \log_5 17$

$x + 1 = \log_5 17$

$x = -1 + \frac{\log 17}{\log 5}$

$x \approx 0.760$

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12. A Brust-Wurst is boiled at $98^oC$ and then placed in $16^oC$ water to cool. Five minutes later the temperature of the Brust-Wurst is $35^oC$. Use Newton's Law of Cooling to find k.

$T(t) = T_S + (T_0 - T_S)e^{-kt}$

$35 = 16 + (98-16)e^{-k(5)}$

$35 = 16 + 82e^{-5k}$

$19 = 82e^{-5k}$

$\frac{19}{82} = e^{-5k}$

$\ln\frac{19}{82} = \ln e^{-5k}$

$\ln\frac{19}{82} = -5k$

$-\frac{1}{5}\ln\frac{19}{82} = K$

$.2925 \approx K$

Now, use *k* to find the *time* when $T = 22^oC$.

$T(t) = T_S + (T_0 - T_S)e^{-kt}$

$22 = 16 + (98-16)e^{-(.2925)t}$

$22 = 16 + 82e^{-.2925t}$

$6 = 82e^{-.2925t}$

$\frac{6}{82} = e^{-.2925t}$

$\ln\frac{6}{82} = \ln e^{-.2925t}$

$\ln\frac{6}{82} = -.2925t$

$\frac{\ln\frac{6}{82}}{-.2925} = t$

$8.94 \approx t$

13. How many years will it take for carbon-14 to diminish to 3% of its original amount after the death of a plant or animal?

$A = A_0 e^{-0.000124t}$

$A = .03$

$A_0 = 100\% = 1$

$.03 = 1 \cdot e^{-0.000124t}$

$\ln .03 = \ln e^{-0.000124t}$

$\ln .03 = -0.000124t$

$\frac{\ln .03}{-0.000124} = t$

$28{,}278.693 \text{ years} \approx t$

14. At what rate compounded quarterly will $1000 have to be invested to amount to $2500 in 10 years?

$A = P(1+\frac{r}{n})^{nt}$ $\quad n=4$ $\quad P$ $\quad A$ $\quad t$

$2500 = 1000(1+\frac{r}{4})^{4(10)}$

$2.5 = (1+\frac{r}{4})^{40}$

$\pm\sqrt[40]{2.5} = 1+\frac{r}{4}$

$-1 \pm \sqrt[40]{2.5} = \frac{r}{4}$

$-4 \pm 4\sqrt[40]{2.5} = r$

$r \approx .0927$

$r = 9.27\%$

15. A medical researcher is testing a radioactive isotope for use in a new imaging process. She finds that an original sample of 5 grams decays to 1 gram in 6 hours. Find the half-life of the sample to three significant digits. (Use half-life formula.)

$A_0$ $\quad A=$ $\quad = t$

$A = A_0(2)^{-t/h}$

$1 = 5(2)^{-6/h}$

$\frac{1}{5} = (2)^{-6/h}$

$\log_2\frac{1}{5} = \log_2(2)^{-6/h}$

$\log_2\frac{1}{5} = -6/h$

$h \cdot \log_2\frac{1}{5} = -6$

$h = \frac{-6}{\log_2\frac{1}{5}}$

$h = \frac{-6}{\frac{\log\frac{1}{5}}{\log 2}}$

$h = \frac{-6\log 2}{\log\frac{1}{5}}$

$h = 2.584$ hours

ANSWERS:

1. x = 0.204 2. x =5.964 3. x = 2.184 4. x = 1.949 5. x =64.000 6. x =109.006 7. x =10.000
8. Both x = 0 and x = -4 are extraneous. Therefore, no solution. 9. x = 7.000 10. x = -1.990 11. x = .386
12. k = 0.292456; time = 8.941 min 13. 28,278.698 years 14. r = 9.269% 15. 0.035068 hours or 2.1 min