

6.6 NOTES Solving!!!

$$\textcircled{1} \quad 2^x = 7$$

Option 1

$$\log_2 7 = x$$

$$\frac{\log 7}{\log 2} = x \quad \text{exact}$$

$$2.81 \approx x \quad \text{Approx}$$

Option 2

$$\log_2 2^x = \log_2 7$$

$$x = \log_2 7$$

Option 3

$$\ln 2^x = \ln 7$$

$$\frac{x \ln 2}{\ln} = \frac{\ln 7}{\ln 2}$$

$$x = \frac{\ln 7}{\ln 2} \approx 2.81$$

(2) $\log_5 (x^2 + x + 5) = 2$

bump

$$5^2 = x^2 + x + 5$$

$$25 = x^2 + x + 5$$

$$0 = x^2 + x - 20$$

$$0 = (x + 5)(x - 4)$$

$$x + 5 = 0$$

$$x - 4 = 0$$

$$x = -5$$

$$x = 4$$

$$\textcircled{3} \quad e^{x+4} = 7$$

$$\cancel{\log_e e^{x+4}} = \log_e 7 \quad \cancel{\ln e^{x+4}} = \ln 7$$

$$x+4 = \log_e 7$$

$$x+4 = \ln 7$$

$$x = \log_e 7 - 4$$

$$x = (\ln 7) - 4$$

Simplify:

$$\textcircled{4} \quad \log_5 40 - \log_5 8$$

$$\log_5 \left(\frac{40}{8} \right)$$

$$\frac{\log 40}{\log 5}$$

$$\cancel{\log_5 5} \quad \textcircled{1}$$

$$5^x = 5 \quad \textcircled{1}$$

$$\textcircled{5} \quad 2 \log_5 x^3 = \log_5 9$$

$$\log_5 x^2 = \log_5 9$$

$$x^2 = 9$$

$$x = 3$$

$$x = -3$$

extraneous

$$\textcircled{6} \quad \log_5 (x+6) + \log_5 (x+2) = 1$$

$$\log_5 (x+6)(x+2) = 1$$

$$\log_5 (x^2 + 8x + 12) = 1$$

bump

$$5' = x^2 + 8x + 12$$

$$0 = x^2 + 8x + 7$$

$$0 = (x + 1)(x + 7)$$

$$x = -1$$

😊

$$~~x = -7~~$$

extraneous

$$\textcircled{7} \quad \frac{\cancel{.3} (4^{.2x})}{\cancel{.3}} = \frac{.2}{.3}$$

$$4^{.2x} = \frac{2}{3}$$

$$\log_4 4^{.2x} = \log_4 \frac{2}{3}$$

$$\cancel{.2} x = \frac{\log_4 \left(\frac{2}{3} \right)}{\cancel{.2}}$$

$$x = \frac{\log_4 \left(\frac{2}{3} \right)}{.2} \text{ EXACT}$$

$$\ln 4^{.2x} = \ln \frac{2}{3}$$
$$\frac{.2x (\ln 4)}{\ln 4} = \frac{\ln \frac{2}{3}}{\ln 4}$$

$$\frac{.2x}{.2} = \frac{\ln \frac{2}{3}}{\ln 4}$$

$$x \approx -1.46 \text{ APPROX.}$$

$$(8) \quad 6^{x-2} = 5$$

$$\log_6 5 = x - 2$$

$$\frac{\log 5}{\log 6} + 2 = x - 2$$

$$\frac{\log 5}{\log 6} + 2 = x$$

$$\approx 2.90$$

$$\frac{\ln 5}{\ln 6} + 2$$

$$(9) \quad 2^{x-3} = 3^x \quad \star\star\star$$

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

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

$$\begin{array}{r} x \ln 2 - 3 \ln 2 = x \ln 3 \\ -x \ln 3 \qquad \qquad -x \ln 3 \end{array}$$

$$\begin{array}{r} x \ln 2 - x \ln 3 - 3 \ln 2 = 0 \\ \qquad \qquad \qquad + 3 \ln 2 \qquad + 3 \ln 2 \end{array}$$

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

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

$$\frac{x(\ln \frac{2}{3})}{\ln \frac{2}{3}} = \frac{\ln 8}{\ln \frac{2}{3}}$$

$$X = \frac{\ln 8}{\ln \frac{2}{3}} = \frac{\log 8}{\log \frac{2}{3}}$$