

Math 27, HW #17 Selected Problems

Pg. 217, #29 Solve:  $\left(\frac{2}{3}\right)^x = \frac{81}{16}$

$$\Rightarrow \left(\frac{2}{3}\right)^x = \frac{3^4}{2^4} = \left(\frac{3}{2}\right)^4 = \left(\frac{2}{3}\right)^{-4} \Rightarrow \boxed{x = -4}$$

Pg. 217, #46 Solve:  $\ln(3x+5) = 8$

$$\log_e x = y \Rightarrow x = e^y$$

$$\Rightarrow 3x+5 = e^8 \Rightarrow \boxed{x = \frac{e^8 - 5}{3}}$$

Pg. 217, #53

Simplify:  $5 - e^{\ln(x^2+1)}$

$$\Rightarrow 5 - (x^2+1) = \boxed{4-x^2} = \boxed{(2+x)(2-x)}$$

Pg. 218, #65 Solve:  $5(2^{3-x}) - 13 = 100$

$$\Rightarrow 2^{3-x} = \frac{113}{5} \Rightarrow \log 2^{3-x} = \log \left( \frac{113}{5} \right)$$

$$\Rightarrow (3-x) \cdot \log 2 = \log \left( \frac{113}{5} \right) \Rightarrow 3-x = \frac{\log \left( \frac{113}{5} \right)}{\log 2}$$

$$\Rightarrow x = \frac{-\log \left( \frac{113}{5} \right)}{\log 2} + 3$$

Pg. 218, #71 Solve:  $e^{2x} - 4e^x - 5 = 0$

Let  $u = e^x$

$$u^2 - 4u - 5 = 0$$

$$\Rightarrow (e^x + 1)(e^x - 5) = 0$$

$$e^x + 1 = 0 \quad \text{OR} \quad e^x - 5 = 0$$

$$e^x = -1$$

$$e^x = 5$$

No solution

$$\ln e^x = \ln 5$$

$$x = \ln 5 =$$

$$9^{1/2} = \sqrt{9} = 3$$

Pg. 218, #109 Solve:  $\log_4 x - \log_4 (x-1) = 1/2$

$$\Rightarrow \log_4 \left( \frac{x}{x-1} \right) = \frac{1}{2} \Rightarrow \frac{x}{x-1} = 4^{1/2} = 2$$

$$\Rightarrow x = (x-1) \cdot 2 = 2x-2 \Rightarrow -x = -2 \Rightarrow \boxed{x=2}$$

Pg. 218, #112 Solve:  $\ln(x+1) - \ln(x-2) = \ln x$

$$\ln \left( \frac{x+1}{x-2} \right) = \ln x$$

IV

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

$$\Rightarrow x+1 = (x-2)x \Rightarrow x+1 = x^2-2x \Rightarrow 0 = x^2-3x-1$$

By the QF:  $x = \frac{3 \pm \sqrt{9+4}}{2} = \frac{3 \pm \sqrt{13}}{2}$

$$x = \frac{3 - \sqrt{13}}{2}$$

or  $x = \frac{3 + \sqrt{13}}{2}$

$$= -0.303$$

$$= \boxed{3.303}$$