13.3/

Soln Set 29

2. a) $10^{2x}=93 \Rightarrow \log 93 = 2x \Rightarrow \boxed{x=\frac{1}{2}\log 93}$

b) $16^{3x+2}=10^6 \Rightarrow 3x+2=6 \Rightarrow \boxed{x=\frac{4}{3}}$

c) $2^{x+1}=7 \Rightarrow \log_2 7 = x+1 \Rightarrow \boxed{x=(\log_2 7)-1}$

d) $3^x \cdot 3^{x^2}=3 \Rightarrow 3^{x^2+x}=3^1 \Rightarrow x^2+x=1 \Rightarrow x^2+x-1=0 \Rightarrow x=\frac{-1\pm\sqrt{1+4}}{2}$

$$\boxed{x=\frac{-1}{2}\pm\frac{\sqrt{5}}{2}}$$

4. a) $3\ln x+5=(\ln x)\ln 2 \Rightarrow 5=(\ln 2-3)\ln x \Rightarrow e^5=e^{\ln x(\ln 2-3)}$

$\Rightarrow e^5=x^{\ln 2-3} \Rightarrow x=(e^5)^{\frac{1}{\ln 2-3}} \Rightarrow \boxed{x=e^{\frac{5}{\ln 2-3}}}$

b) $2(7^{1+\log x})=8 \Rightarrow 7^{1+\log x}=4 \Rightarrow \log_7 4 = 1+\log x \Rightarrow \log_7 4-1=\log x$

$\Rightarrow \boxed{10^{\log_7 4-1}=x}$

c) $Ke^x+k=Le^x-L,\ 0<k<L \Rightarrow k+L=(L-k)e^x \Rightarrow e^x=\frac{k+L}{L-k}$

$\boxed{x=\ln\left(\frac{L+k}{L-k}\right)}$ The $0<k<L$ tells us it's okay to have $L-k$ in the denominator because it's not 0, and $\frac{L+k}{L-k}>0$, which is good because ln of a negative number is undefined.

d) $R(1+n)^{nx}=(P_n)^x \Rightarrow R^{\frac{1}{x}}(1+n)^n=P_n \Rightarrow R^{\frac{1}{x}}=\frac{P_n}{(1+n)^n} \Rightarrow \frac{1}{x}=\log_R\left(\frac{P_n}{(1+n)^n}\right)$

$\Rightarrow \boxed{x=\frac{1}{\log_R\left(\frac{P_n}{(1+n)^n}\right)}}$

e) $3b^x=c^x 3^{2x} \Rightarrow 3^{\frac{1}{x}}b=c\cdot 3^2 \Rightarrow 3^{\frac{1}{x}-2}=\frac{c}{b} \Rightarrow \frac{1}{x}-2=\log_3\frac{c}{b}$

$\Rightarrow \frac{1}{x}=\log_3\frac{c}{b}+2 \Rightarrow \boxed{x=\frac{1}{\log_3\frac{c}{b}+2}}$

5. a) $2^{x^2}\cdot 2^x=3^x \Rightarrow 2^{x^2+x}=3^x \Rightarrow \log_2(2^{x^2+x})=\log_2 3^x \Rightarrow x^2+x=x\log_2 3$

$\Rightarrow x^2+x(1-\log_2 3)=0 \Rightarrow \boxed{x=0,\ \log_2 3-1}$

b) $3^{x^2+2x}=1=3^0 \Rightarrow x^2+2x=0 \Rightarrow \boxed{x=0,-2}$

5. c) $3\ln(x^4) - 2\ln 2x = 10 \Rightarrow 12\ln x - 2(\ln 2 + \ln x) = 10$

$\Rightarrow 10\ln x - 2\ln 2 = 10 \Rightarrow \ln x^{10} - \ln 2^2 = 10 \Rightarrow e^{(\ln x^{10} - \ln 2^2)} = e^{10}$

$\Rightarrow \frac{x^{10}}{4} = e^{10} \Rightarrow x^{10} = 4e^{10} \Rightarrow \boxed{x = 2^{1/5} \cdot e}$

d) $e^{2x} + e^x - 6 = 0 \Rightarrow e^{2x} + e^x = 6 \Rightarrow e^x(e^2+1) = 6 \Rightarrow e^x = \frac{6}{e^2+1}$

$\Rightarrow \boxed{x = \ln\left(\frac{6}{e^2+1}\right)}$

13.4/2. $y = \ln(x^2) \Rightarrow y = 2\ln(x)$. Has zero when $x = 1$