

~~Name:~~~~It consists of 4 questions. Please show all your work to get full credit.~~1 (2.5 pts) If $3^{t^2-4} = 27^t$, what is t ?

$$\begin{aligned}
 \text{(S.O.) } & 3^{t^2-4} = 27^t \\
 \Rightarrow & 3^{t^2-4} = (3^3)^t \\
 \Rightarrow & 3^{t^2-4} = 3^{3t} \\
 \Rightarrow & t^2-4 = 3t \\
 \Rightarrow & t^2-3t-4 = 0 \\
 \Rightarrow & (t-4)(t+1) = 0 \\
 \Rightarrow & t = -1, t = 4.
 \end{aligned}$$

2 (2.5 pts) Solve $3^{x-x^2} = \frac{1}{9^x}$.

$$\begin{aligned}
 \underline{\text{Sol}} & 3^{x-x^2} = \frac{1}{9^x} \\
 \Rightarrow & 3^{x-x^2} = \left(\frac{1}{3^2}\right)^x \\
 \Rightarrow & 3^{x-x^2} = (3^{-2})^x \\
 \Rightarrow & 3^{x-x^2} = 3^{-2x} \\
 \Rightarrow & x-x^2 = -2x \\
 \Rightarrow & 3x-x^2 = 0 \\
 \Rightarrow & x(3-x) = 0 \\
 \Rightarrow & x = 0, x = 3.
 \end{aligned}$$

3 (2.5 pts) Simplify $A = \log_3 27 + \ln\left(\frac{1}{e^4}\right) - \log_5 1$.

Sol

$$\begin{aligned} A &= \log_3 27 + \ln\left(\frac{1}{e^4}\right) - \log_5 1 \\ &= \log_3 3^3 + \ln(e^{-4}) - \log_5 1 \\ &= 3 \cdot \log_3 3 - 4 \ln e - \log_5 1 \\ &= 3 \cdot 1 - 4 \cdot 1 - 0 \\ &= 3 - 4 = -1. \end{aligned}$$

4 (2.5 pts) Solve $4e^{t-1} = 4$.

Sol

$$\begin{aligned} 4e^{t-1} &= 4 \\ \Rightarrow e^{t-1} &= 1 \\ \Rightarrow \ln e^{t-1} &= \ln 1 \\ \Rightarrow (t-1) \cdot \ln e &= 0 \\ \Rightarrow t-1 &= 0 \\ \Rightarrow t &= 1. \end{aligned}$$