

$$\#1. \log_5 |2 \log_3 x| = 0$$

$$\#2. y = \ln \left[2 \left(x + \frac{1}{2} \right) \right]$$

$$2 \log_3 x = 5^0 = 1$$

$$\log_3 x^2 = 1$$

$$x^2 = 3$$

$$x = \pm \sqrt{3} \quad x > 0$$

$$\boxed{x = \sqrt{3}}$$

$y = \ln x$ is horizontally dilated by a factor of $\frac{1}{2}$ and then translated $\frac{1}{2}$ to left

$$\#3 (a) \log_3 27 = \frac{\log_3 27}{\log_3 3} = \frac{\log_3 3^3}{\log_3 3} = \boxed{3}$$

$$\log_8 \frac{1}{8} = \log_8 8^{-1} = \boxed{-1}$$

$$\log_{16} 4 = \frac{\log_4 4}{\log_4 16} = \frac{\log_4 4}{\log_4 4^2} = \boxed{\frac{1}{2}}$$

$$(b) \frac{3}{2} = \log_4 x$$

$$\Rightarrow \frac{3}{2} = \log_4 x \Rightarrow x = 4^{\frac{3}{2}} = (\sqrt{4})^3 = \boxed{8}$$

$$\#4. 6^{2x-1} = 6^{3x}$$

$$\Rightarrow 2^{3(2x-1)} = (2 \cdot 3)^{3x}$$

$$\Rightarrow 2^{3x} \cdot 2^{-3} = 2^{3x} \cdot 3^{3x}$$

$$\Rightarrow \ln 2^{-3} = \ln 3^{3x} \Rightarrow \ln(2)^{-3} = 3x \cdot \ln 3$$

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

$$\boxed{x = \frac{-\ln 2}{\ln 3}}$$

#5 $\log_6 36 = \log_6 6^2 = \boxed{2}$

$\log_6 4 + \log_6 9 = \log_6 36 = \boxed{2}$

$\log_6 2 - \log_6 12 = \log_6 \frac{2}{12} = \log_6 \frac{1}{6} = \boxed{-1}$

#6 $\log_{x+1} y = 2 \Rightarrow y = (x+1)^2$

(y > 0)

$\log_{y+1} x = \frac{1}{4} \Rightarrow (x)^{\frac{1}{4}} = (y+1)^{\frac{1}{4}}$

(x > 0)

$x^{\frac{1}{4}} = y+1 \Rightarrow y = x^{\frac{1}{4}} - 1$

$x^{\frac{1}{4}} - 1 = (x+1)^2$

$x^{\frac{1}{4}} - 1 = x^2 + 2x + 1$

$x^{\frac{1}{4}} - x^2 - 2x - 2 = 0$

Syn Division

$$\begin{array}{r}
 -1 \overline{) \begin{array}{cccc}
 1 & 0 & -1 & -2 & -2 \\
 -1 & +1 & & 0 & 2 \\
 \hline
 1 & -1 & 0 & -2 & 0
 \end{array}
 }$$

$x = -1$

$1 - 1 + 2 - 2$

$8 - 4 - 2$

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

$x > 0$ use cal $x \approx 1.70$

$y \approx 7.35$

7. $2 - \log_3 (x+7) = \log_{\frac{1}{3}} 2x$

$\Rightarrow \log_3 3^2 - \log_3 (x+7) = -\log_3 2x$

$\Rightarrow \log_3 \left(\frac{9}{x+7} \right) = \log_3 (2x)^{-1}$

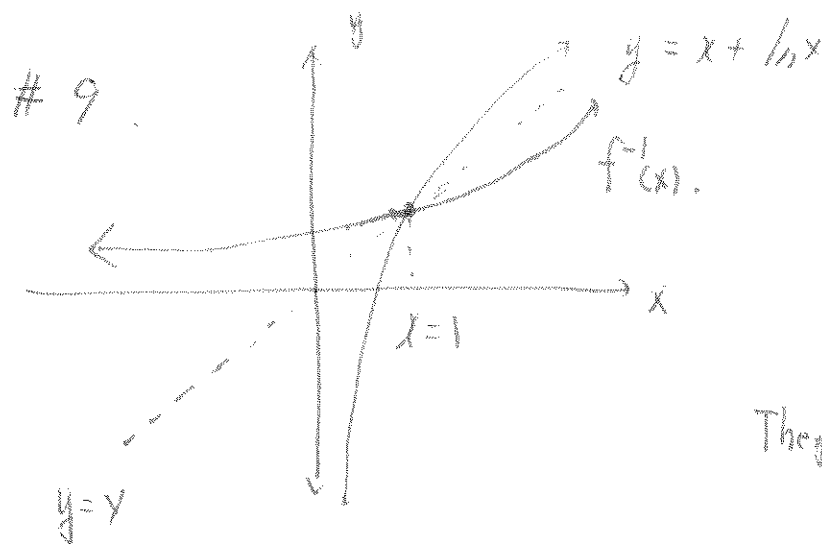
$\Rightarrow \frac{9}{x+7} = \frac{1}{2x}$

$\Rightarrow 18x = x+7$

$\Rightarrow 17x = 7 \Rightarrow \boxed{x = \frac{7}{17}}$

8. $f(x) = \ln(x-3) - 2 = \ln(x-3) - \ln e^2$

$\left(\begin{matrix} 3 \\ -2 \end{matrix} \right)$ $\left\{ \begin{array}{l} x \text{ direction 3 units Right} \\ y \text{ direction 2 units down} \end{array} \right.$ $= \ln \frac{(x-3)}{e^2}$



$x = y + \ln y$

They intersect at $\boxed{x=1}$
 $\boxed{y=1}$

$x = x + \ln x$
 $\ln x = 0 \quad x = e^0 = 1$

10 $a = \frac{\log_2 3}{\log_2 2} \times \frac{\log_2 4}{\log_2 3} \times \frac{\log_2 5}{\log_2 4} \times \frac{\log_2 32}{\log_2 31}$
 $= \log_2 32 = \boxed{5}$