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

$|2\log_3 x| = 3^0 = 1$

$|2\log_3 x| = 1$

$\log_3 x = \frac{1}{2}$ or $-\frac{1}{2}$

$x = \sqrt{3}$ $\quad x = \frac{1}{\sqrt{3}}$

$(\sqrt{3})\left(\frac{1}{\sqrt{3}}\right) = 1$

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

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

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

$\log_3 \frac{1}{3} = \log_3 3^{-1} = \boxed{-1}$

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

(b) $3 + (-1) - \frac{1}{2} = \log_4 x$

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

#4. $8^{x-1} = 6^{3x}$

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

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

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

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

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

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

$(y>0)$

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

$(x>0)$ $\qquad x^4 = y+1 \Rightarrow y = x^4 - 1$

$x^4 - 1 = (x+1)^2$

$x^4 - 1 = x^2 + 2x + 1$

$x^4 - x^2 - 2x - 2 = 0$

Syn Division

$x = -1$

$1 - 1 + 2 - 2$

$8 - 4 - 2$

$-1 \;|\; 1 \quad 0 \quad -1 \quad -2 \quad -2$

$\qquad\quad -1 \quad +1 \quad 0 \quad 2$

$\qquad\quad 1 \quad -1 \quad 0 \quad -2 \quad 0$

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

$x > 0$ $\qquad$ use cal

$\boxed{x \approx 1.70}$

$\boxed{y \approx 7.35}$

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

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

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

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

$\Rightarrow 18x = x+7$

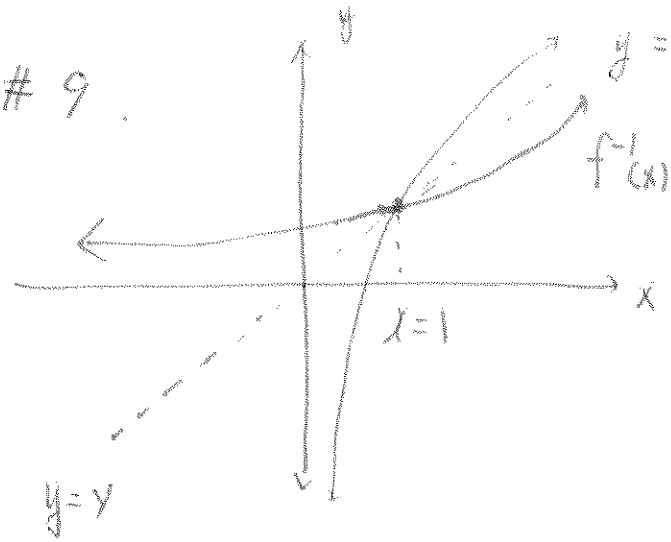
$\Rightarrow 17x = 7 \Rightarrow \boxed{x = \frac{7}{17}}$

#8 $f(x) = -[\ln(x-3) - 2] = -\ln(x-3) + \ln e^2$

$\begin{pmatrix} 3 \\ -2 \end{pmatrix}$ — 3 → x direction 3 units Right; −2 → y direction 2 units down

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

#9



$x = y + \ln y$

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

$x = x + \ln x$

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

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

$= \log_2 32 = \boxed{5}$