$x=1 \Rightarrow f(1)=3^{A(1)+B}=3^{A+B}$ ① $\quad$ ① − ② $= (3A+B)-(A+B)=2-0$ .1

$2A=2 \Rightarrow A=1, B=-1$

$3^{A+B}=1 \Rightarrow 3^0=1 \Rightarrow A+B=0$ ②

$f(0)=3^{A(0)+B}=3^{B}=3^{-1} \Rightarrow f(0)=\frac{1}{3}$

$x=3 \Rightarrow f(3)=3^{3A+B}$

$3^{3A+B}=9 \Rightarrow 3A+B=2$ ③

$4^a+15=2^{a+3}$ .2

$2^{2a}+15=2^{a+3} \Rightarrow 2^{2a}+15=8\times 2^a \xrightarrow{2^a=t} t^2+15=8t \Rightarrow t^2-8t+15=0$

$\Rightarrow t=3, t=5$

$2^a=3 \Rightarrow \log_2^3 \qquad 2^a=5 \Rightarrow \log_2^5$

$\log_2^3+\log_2^5=\log_2^{15}$

$21=3\times 7 \qquad 147=3\times 7^2 \qquad 1323=3^3\times 7^2$ .3

$\log_{21}^{147}=\log_{21}^{(3\times 7^2)}=\log_{21}^3+\log_{21}^7 \qquad \log_{21}^{1323}=\log_{21}^{(3^3\times 7^2)}=3\log_{21}^3+2\log_{21}^7$

$a=\log_{21}^3 \qquad b=\log_{21}^7 \qquad \log_{21}^{21}=1 \Rightarrow a+b=1$

$a^2+(a+2b)(3a+2b) \Rightarrow 3a+2-2a=a+2 \Rightarrow (2-a)(a+2)+a^2$

$(a+2)(2-a)=4-a^2 \Rightarrow a^2+(4-a^2)=4$

$x^2-2x+1=(x-1)^2 \Rightarrow \log(x-1)^2+3\log(1-x)=5 \qquad x<1 \Rightarrow (x-1)^2=(1-x)^2$ .4

$\log(1-x)^2+3\log(1-x)=5 \qquad 2\log(1-x)+3\log(1-x)=5$

$\log(1-x)=1 \qquad 1-x=10 \Rightarrow x=-9 \qquad \Rightarrow 5\log(1-x)=5 \qquad \log_3^{(-x)}=\log_3^9=2$

$\log_2[(x^2+2x+4)(x-2)]=3 \Rightarrow (x^2+2x+4)(x-2)=2^3$ .5

$(x^2+2x+4)(x-2)=8 \Rightarrow x^3-8=8 \Rightarrow x^3=16 \Rightarrow x=\sqrt[3]{16}$

$\log_{\sqrt[3]{2}}^x \Rightarrow x=(2^4)^{1/3}=2^{4/3} \qquad \log_2^{2^{4/3}}=\frac{4/3}{1/3}=4$

$2-x>0 \Rightarrow x<2$ .6

$\log_{\frac{1}{(x-2)^2}}(2-x) = 3 \Rightarrow \log((2-x)(x-2)^2)$

$(x-2)^2 = (2-x)^2 \Rightarrow (2-x)(2-x)^2 = (2-x)^3$

$\log(2-x)^3 = 3 \Rightarrow 3\log(2-x) = 3 \Rightarrow \log(2-x) = 1 \Rightarrow 2-x = 10 \Rightarrow x = -8$

$\log_{\sqrt{2}}(-x) \Rightarrow \log_{\sqrt{2}}^{8} = \frac{3}{\frac{1}{2}} = 6$

.7

$3^{x^2-2} = 3^{4x} \Rightarrow x^2-2 = 4x \Rightarrow x^2-4x-2=0 \Rightarrow x = 2\pm\sqrt{6}$

$x>2 \Rightarrow x = 2+\sqrt{6} > 2$ ✓

$\Rightarrow x-2 = \sqrt{6}$ $2-\sqrt{6} < 2$ ✗

$\log_6^{\sqrt{6}} = 1/2$

.8

$8 = 2^3 \quad 18 = 2\times 3^2$

$\log_{18}^{8} = \frac{\log 8}{\log 18}$ $\log 8 = \log 2^3 = 3\log 2$ $\log 18 = \log 2 + 2\log 3$

$\frac{\log 2}{\log 3} = \frac{5}{8} \Rightarrow \log 2 = \frac{5}{8}\log 3 \Rightarrow \frac{5}{8}\log 3 + \frac{16}{3}\log 3 = \frac{21}{8}\log 3$

$3\log 2 = 3\times\frac{5}{8}\log 3 = \frac{18}{8}\log 3$

$\frac{\frac{18}{8}}{\frac{21}{8}}\frac{\frac{15}{8}\log 3}{\log 3} = \frac{5}{7}$

.9

$\frac{\log 3}{\log 4} = \frac{4}{5} \Rightarrow \log 3 = \frac{4}{5}\log 4$ $\log 3 = \frac{4}{5}\times 2\log 2 = \frac{8}{5}\log 2$

$\log 6 = \log 2 + \log 3 = \frac{13}{5}\log 2$ (I) $\log 12 = 2\log 3 + \log 4 = \frac{18}{5}\log 2$ (II)

$\frac{(I)}{(II)} = \frac{13}{18}$

.10

$(a\log 2)(-1)^2 + a(-1) + b\log 2 = 0 \Rightarrow a\log 2 - a + b\log 2 = 0$

$(a+b)\log 2 - a = 0 \Rightarrow (a+b)\log 2 = a$ $a+b = \frac{a}{\log 2}$ $b = \frac{a}{\log 2} - a$

$b = a\left(\frac{1}{\log 2} - 1\right)$ $\frac{b}{a} = \frac{1}{\log 2} - 1$ $(\sqrt{2})^{\frac{b}{a}} = 2^{\frac{1}{2}\log 2 - \frac{1}{2}}$

$2^{\frac{1}{\log 2}} = 10$ $\frac{\sqrt{10}}{\sqrt{2}} = \sqrt{5}$