COMPLEX LOGARITHM WITH DIFFERENT BASES

$$\log_2(x-1) = \log_4 x+5$$

First change the second log to $\log_2$

$$= \log_2(x-1) = \frac{\log_2 x+5}{\log_2 4}$$

$$= \log_2(x-1) = \frac{\log_2 x+5}{2}$$

$$= \log_2(x-1) = \frac{1}{2}\log_2 x+5$$ To simplify, multiply both by ②

$$= 2\log_2(x-1) = \log_2 x+5$$

$$= \log_2(x-1)^2 = \log_2 x+5$$

Now since we have the same base, we can simplify

$$= (x-1)^2 = x+5$$

$$= (x-1)(x-1) = x+5$$

$$= x^2-x-x+1 = x+5$$

$$= x^2-2x+1-x=5$$

$$= x^2-3x+1-5=0$$

$$= x^2-3x-4=0$$ (Now factorise) $-4, 1$

$$= x-4=0 \quad = \quad x=4$$

or $x+1=0 \quad x=-1$