

- 1    **a** 1.78                      **b** 0.778                      **c** 2.40                      **d** -0.398
- 2    **a**  $x = \lg 14 = 1.15$                       **b**  $10^x = 4$   
 $x = \lg 4 = 0.60$                       **c**  $3x = \lg 49$   
 $x = \frac{1}{3} \lg 49 = 0.56$
- d**  $x - 4 = \lg 23$                       **e**  $2x + 1 = \lg 130$                       **f**  $(10^2)^x = 10^{2x} = 5$   
 $x = 4 + \lg 23 = 5.36$                        $x = \frac{1}{2}(\lg 130 - 1) = 0.56$                        $2x = \lg 5$   
 $x = \frac{1}{2} \lg 5 = 0.35$
- 3    let  $y = \log_a b \Rightarrow a^y = b$   
 $y \log_c a = \log_c b$   
 $y = \frac{\log_c b}{\log_c a}$   
 $\therefore \log_a b = \frac{\log_c b}{\log_c a}$
- 4    **a**  $= \frac{\lg 7}{\lg 2} = 2.81$                       **b**  $= \frac{\lg 172}{\lg 20} = 1.72$                       **c**  $= \frac{\lg 49}{\lg 5} = 2.42$                       **d**  $= \frac{\lg 4}{\lg 9} = 0.631$
- 5    **a**  $x \lg 3 = \lg 12$                       **b**  $x \lg 2 = \lg 0.7$                       **c**  $-y \lg 8 = \lg 3$                       **d**  $\frac{1}{2}x \lg 4 = \lg 0.3$   
 $x = \frac{\lg 12}{\lg 3}$                        $x = \frac{\lg 0.7}{\lg 2}$                        $y = -\frac{\lg 3}{\lg 8}$                        $x = \frac{2 \lg 0.3}{\lg 4}$   
 $x = 2.26$                        $x = -0.515$                        $y = -0.528$                        $x = -1.74$
- e**  $(t + 3) \lg 5 = \lg 24$     **f**  $(4 + x) \lg 3 = \lg 16$     **g**  $(2x + 4) \lg 7 = \lg 12$     **h**  $2^{3x+1} = 12.4$   
 $t = \frac{\lg 24}{\lg 5} - 3$                        $x = \frac{\lg 16}{\lg 3} - 4$                        $x = \frac{1}{2} \left( \frac{\lg 12}{\lg 7} - 4 \right)$                        $(3x + 1) \lg 2 = \lg 12.4$   
 $t = -1.03$                        $x = -1.48$                        $x = -1.36$                        $x = \frac{1}{3} \left( \frac{\lg 12.4}{\lg 2} - 1 \right)$   
 $x = 0.877$
- i**  $(2 - 3x) \lg 4 = \lg 32.7$                       **j**  $x \lg 5 = (x - 1) \lg 6$   
 $x = \frac{1}{3} \left( 2 - \frac{\lg 32.7}{\lg 4} \right)$                        $x(\lg 6 - \lg 5) = \lg 6$   
 $x = -0.172$                        $x = \frac{\lg 6}{\lg 6 - \lg 5} = 9.83$
- k**  $(y + 2) \lg 7 = (y + 1) \lg 9$                       **l**  $(5 - x) \lg 4 = (2x - 1) \lg 11$   
 $y(\lg 9 - \lg 7) = 2 \lg 7 - \lg 9$                        $x(2 \lg 11 + \lg 4) = 5 \lg 4 + \lg 11$   
 $y = \frac{2 \lg 7 - \lg 9}{\lg 9 - \lg 7} = 6.74$                        $x = \frac{5 \lg 4 + \lg 11}{2 \lg 11 + \lg 4} = 1.51$
- m**  $\left(\frac{1}{2}x + 3\right) \lg 4 = (1 - 2x) \lg 5$                       **n**  $(3y - 2) \lg 2 = (2y + 5) \lg 3$   
 $x \left(\frac{1}{2} \lg 4 + 2 \lg 5\right) = \lg 5 - 3 \lg 4$                        $y(3 \lg 2 - 2 \lg 3) = 5 \lg 3 + 2 \lg 2$   
 $x = \frac{\lg 5 - 3 \lg 4}{\frac{1}{2} \lg 4 + 2 \lg 5} = -0.652$                        $y = \frac{5 \lg 3 + 2 \lg 2}{3 \lg 2 - 2 \lg 3} = -58.4$
- o**  $7^{2x+4} = 11^{3x-4}$                       **p**  $3^{x+1} = 2^{4+x}$   
 $(2x + 4) \lg 7 = (3x - 4) \lg 11$                        $(x + 1) \lg 3 = (4 + x) \lg 2$   
 $x(3 \lg 11 - 2 \lg 7) = 4 \lg 7 + 4 \lg 11$                        $x(\lg 3 - \lg 2) = 4 \lg 2 - \lg 3$   
 $x = \frac{4 \lg 7 + 4 \lg 11}{3 \lg 11 - 2 \lg 7} = 5.26$                        $x = \frac{4 \lg 2 - \lg 3}{\lg 3 - \lg 2} = 4.13$

**6 a**  $(2^x + 3)(2^x - 2) = 0$   
 $2^x = -3$  [no sols], 2  
 $x = 1$

**b**  $(3^x - 1)(3^x - 4) = 0$   
 $3^x = 1, 4$   
 $x = 0, \frac{\lg 4}{\lg 3} = 0, 1.26$

**c**  $5^{2x} - 8(5^x) + 12 = 0$   
 $(5^x - 2)(5^x - 6) = 0$   
 $5^x = 2, 6$   
 $x = \frac{\lg 2}{\lg 5}, \frac{\lg 6}{\lg 5} = 0.43, 1.11$

**d**  $2(4^{2x}) - 7(4^x) + 3 = 0$   
 $(2(4^x) - 1)(4^x - 3) = 0$   
 $4^x = \frac{1}{2}, 3$   
 $x = -\frac{1}{2}, \frac{\lg 3}{\lg 4} = -\frac{1}{2}, 0.79$

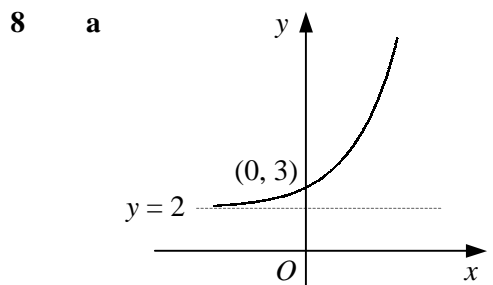
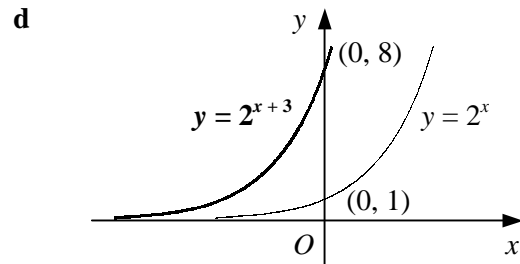
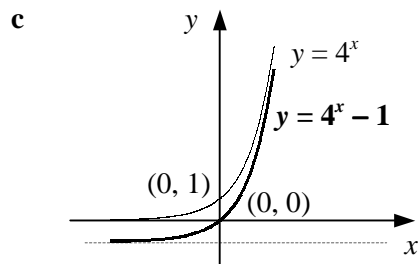
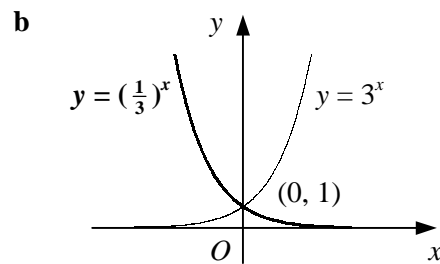
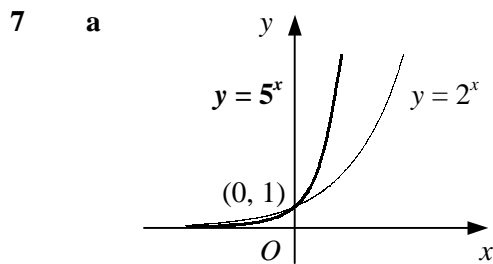
**e**  $2(2^{2y}) + 7(2^y) - 15 = 0$   
 $(2(2^y) - 3)(2^y + 5) = 0$   
 $2^y = -5$  [no sols],  $\frac{3}{2}$   
 $y = \frac{\lg \frac{3}{2}}{\lg 2} = 0.58$

**f**  $3(3^{2x}) - 17(3^x) + 10 = 0$   
 $(3(3^x) - 2)(3^x - 5) = 0$   
 $3^x = \frac{2}{3}, 5$   
 $x = \frac{\lg \frac{2}{3}}{\lg 3}, \frac{\lg 5}{\lg 3} = -0.37, 1.46$

**g**  $5^{2t} + 5(5^t) - 24 = 0$   
 $(5^t + 8)(5^t - 3) = 0$   
 $5^t = -8$  [no sols], 3  
 $t = \frac{\lg 3}{\lg 5} = 0.68$

**h**  $3(3^{2x}) - 18(3^x) + 15 = 0$   
 $3(3^x - 1)(3^x - 5) = 0$   
 $3^x = 1, 5$   
 $x = 0, \frac{\lg 5}{\lg 3} = 0, 1.46$

**i**  $3(4^{2x}) - 16(4^x) + 5 = 0$   
 $(3(4^x) - 1)(4^x - 5) = 0$   
 $4^x = \frac{1}{3}, 5$   
 $x = \frac{\lg \frac{1}{3}}{\lg 4}, \frac{\lg 5}{\lg 4} = -0.79, 1.16$



**9**  $x = 0 \Rightarrow y = -4$   
 $y = 0 \Rightarrow 2^x = 5$   
 $x = \frac{\lg 5}{\lg 2}$   
 $AB^2 = 4^2 + \left(\frac{\lg 5}{\lg 2}\right)^2 = 21.391$   
 $AB = 4.63$

**b**  $(3, 29) \Rightarrow 29 = 2 + a^3$   
 $a^3 = 27$   
 $a = 3$