

- 1 **a** $\log_{10} 1000 = 3$ **b** $\log_3 81 = 4$ **c** $\log_2 256 = 8$ **d** $\log_7 1 = 0$
 e $\log_3 \frac{1}{27} = -3$ **f** $\log_{32} \frac{1}{2} = -\frac{1}{5}$ **g** $\log_{19} 19 = 1$ **h** $\log_{36} 216 = \frac{3}{2}$
- 2 **a** $5^3 = 125$ **b** $2^4 = 16$ **c** $10^5 = 100\,000$ **d** $23^0 = 1$
 e $9^{\frac{1}{2}} = 3$ **f** $10^{-2} = 0.01$ **g** $2^{-3} = \frac{1}{8}$ **h** $6^1 = 6$
- 3 **a** $= \log_7 7^2$
 $= 2$ **b** $= \log_4 4^3$
 $= 3$ **c** $= \log_2 2^7$
 $= 7$ **d** $= \log_3 3^3$
 $= 3$
 e $= \log_5 5^4$
 $= 4$ **f** $= \log_8 8^1$
 $= 1$ **g** $= \log_7 7^0$
 $= 0$ **h** $= \log_{15} 15^{-1}$
 $= -1$
 i $= \log_3 3^{-2}$
 $= -2$ **j** $= \lg 10^{-3}$
 $= -3$ **k** $= \log_{16} 16^{\frac{1}{4}}$
 $= \frac{1}{4}$ **l** $= \log_4 4^{\frac{3}{2}}$
 $= \frac{3}{2}$
 m $= \log_9 9^{\frac{5}{2}}$
 $= \frac{5}{2}$ **n** $= \log_{100} 100^{-\frac{3}{2}}$
 $= -\frac{3}{2}$ **o** $= \log_{25} 25^{\frac{3}{2}}$
 $= \frac{3}{2}$ **p** $= \log_{27} 27^{-\frac{2}{3}}$
 $= -\frac{2}{3}$
- 4 **a** $5^x = 25$
 $x = 2$ **b** $2^6 = x$
 $x = 64$ **c** $x^3 = 64$
 $x = 4$ **d** $10^{-3} = x$
 $x = \frac{1}{1000}$
 e $x^{\frac{2}{3}} = 16$
 $x = 64$ **f** $5^x = 1$
 $x = 0$ **g** $x^1 = 9$
 $x = 9$ **h** $10^x = 10^{12}$
 $x = 12$
 i $\log_x 7 = \frac{1}{2}$
 $x^{\frac{1}{2}} = 7$
 $x = 49$ **j** $4^{1.5} = x$
 $x = 8$ **k** $x^{-\frac{1}{3}} = 0.1$
 $x = 1000$ **l** $\log_8 x = -\frac{1}{3}$
 $8^{-\frac{1}{3}} = x$
 $x = \frac{1}{2}$
- 5 **a** $= \log_a (4 \times 7)$
 $= \log_a 28$ **b** $= \log_a (10 \div 5)$
 $= \log_a 2$ **c** $= \log_a 6^2$
 $= \log_a 36$
 d $= \log_a (9 \div \frac{1}{3})$
 $= \log_a 27$ **e** $= \log_a 25^{\frac{1}{2}} + \log_a 3^2$
 $= \log_a 5 + \log_a 9$
 $= \log_a (5 \times 9)$
 $= \log_a 45$ **f** $= \log_a 48 - \log_a 2^3 - \log_a 9^{\frac{1}{2}}$
 $= \log_a 48 - \log_a 8 - \log_a 3$
 $= \log_a [48 \div (8 \times 3)]$
 $= \log_a 2$
- 6 **a** $= 5 \log_q x$ **b** $= \frac{15}{2} \log_q x$ **c** $= \log_q x^{-1}$
 $= -\log_q x$ **d** $= \log_q x^{\frac{1}{3}}$
 $= \frac{1}{3} \log_q x$
 e $= 4 \log_q x^{-\frac{1}{2}}$
 $= -2 \log_q x$ **f** $= 2 \log_q x + 5 \log_q x$
 $= 7 \log_q x$ **g** $= \log_q x^{-2} + \log_q x^{-3}$
 $= -2 \log_q x - 3 \log_q x$
 $= -5 \log_q x$ **h** $= 6 \log_q x - 2 \log_q x$
 $= 4 \log_q x$

$$7 \quad \begin{array}{llll} \mathbf{a} & = \lg(5 \times 4) & \mathbf{b} & = \lg(12 \div 6) & \mathbf{c} & = \lg 2^3 & \mathbf{d} & = \lg 3^4 - \lg 9 \\ & = \lg 20 & & = \lg 2 & & = \lg 8 & & = \lg 81 - \lg 9 \\ & & & & & & & = \lg(81 \div 9) \\ & & & & & & & = \lg 9 \end{array}$$

$$\begin{array}{llll} \mathbf{e} & = \lg 16^{\frac{1}{2}} - \lg 32^{\frac{1}{5}} & \mathbf{f} & = \lg 10 + \lg 11 & \mathbf{g} & = \lg \frac{1}{50} + \lg 10^2 & \mathbf{h} & = \lg 10^3 - \lg 40 \\ & = \lg 4 - \lg 2 & & = \lg(10 \times 11) & & = \lg \frac{1}{50} + \lg 100 & & = \lg 1000 - \lg 40 \\ & = \lg(4 \div 2) & & = \lg 110 & & = \lg(\frac{1}{50} \times 100) & & = \lg(1000 \div 40) \\ & = \lg 2 & & & & = \lg 2 & & = \lg 25 \end{array}$$

$$8 \quad \begin{array}{lll} \mathbf{a} & = \log_3(54 \div 2) & \mathbf{b} & = \log_5(20 \times 1.25) & \mathbf{c} & = \log_2 2^4 + \log_3 3^3 \\ & = \log_3 27 & & = \log_5 25 & & = 4 + 3 \\ & = \log_3 3^3 & & = \log_5 5^2 & & = 7 \\ & = 3 & & = 2 & & \end{array}$$

$$\begin{array}{lll} \mathbf{d} & = \log_6(24 \times 9) & \mathbf{e} & = \log_3(12 \div 4) & \mathbf{f} & = \log_4(18 \div 9) \\ & = \log_6 216 & & = \log_3 3 & & = \log_4 2 \\ & = \log_6 6^3 & & = 1 & & = \log_4 4^{\frac{1}{2}} \\ & = 3 & & & & = \frac{1}{2} \end{array}$$

$$\begin{array}{lll} \mathbf{g} & = \log_9(4 \times 0.25) & \mathbf{h} & = \lg 2^2 + \lg 25 & \mathbf{i} & = \log_3 8^{\frac{1}{3}} - \log_3 18 \\ & = \log_9 1 & & = \lg 4 + \lg 25 & & = \log_3 2 - \log_3 18 \\ & = 0 & & = \lg(4 \times 25) & & = \log_3(2 \div 18) \\ & & & = \lg 100 & & = \log_3 \frac{1}{9} \\ & & & = \lg 10^2 & & = \log_3 3^{-2} \\ & & & = 2 & & = -2 \end{array}$$

$$\begin{array}{lll} \mathbf{j} & = \log_4 64^{\frac{1}{3}} + (2 \times \log_5 5^2) & \mathbf{k} & = \frac{1}{2} \log_5 \frac{25}{16} + \log_5 10^2 & \mathbf{l} & = \log_3 5 - \log_3 6^2 - \log_3 \frac{15}{4} \\ & = \log_4 4 + (2 \times 2) & & = \log_5 \left(\frac{25}{16}\right)^{\frac{1}{2}} + \log_5 100 & & = \log_3 [5 \div (36 \times \frac{15}{4})] \\ & = 1 + 4 & & = \log_5 \frac{5}{4} + \log_5 100 & & = \log_3 \frac{1}{27} \\ & = 5 & & = \log_5 \left(\frac{5}{4} \times 100\right) & & = \log_3 3^{-3} \\ & & & = \log_5 125 & & = -3 \\ & & & = \log_5 5^3 & & \\ & & & = 3 & & \end{array}$$

$$1 \quad \begin{array}{lll} \mathbf{a} = \log_{10} a + \log_{10} b & \mathbf{b} = \log_{10} a + \log_{10} b^7 & \mathbf{c} = \log_{10} a^3 - \log_{10} b \\ & = \log_{10} a + 7 \log_{10} b & = 3 \log_{10} a - \log_{10} b \\ \mathbf{d} = \log_{10} a + \log_{10} b^{\frac{1}{2}} & & = \log_{10} a + \frac{1}{2} \log_{10} b \\ \mathbf{e} = 2 \log_{10} ab & \mathbf{f} = -\log_{10} ab & \mathbf{g} = \log_{10} a^{\frac{3}{2}} + \log_{10} b^{\frac{5}{2}} \\ = 2 \log_{10} a + 2 \log_{10} b & = -\log_{10} a - \log_{10} b & = \frac{3}{2} \log_{10} a + \frac{5}{2} \log_{10} b \\ \mathbf{h} = 3(\log_{10} a^2 - \log_{10} b^{\frac{1}{3}}) & & = 6 \log_{10} a - \log_{10} b \end{array}$$

$$2 \quad \begin{array}{lll} \mathbf{a} = \log_q 8^2 & \mathbf{b} = \log_q 8^{\frac{1}{3}} & \mathbf{c} = \log_q 16 - \log_q q \\ = 2y & = \frac{1}{3}y & = \log_q 16 - \log_q q \\ & & = \log_q 8^{\frac{4}{3}} - 1 \\ & & = \frac{4}{3}y - 1 \\ \mathbf{d} = \log_q 4 + \log_q q^3 & & = \log_q 4 + \log_q q^3 \\ & & = \log_q 8^{\frac{2}{3}} + 3 \\ & & = \frac{2}{3}y + 3 \end{array}$$

$$3 \quad \begin{array}{lll} \mathbf{a} = \lg(2 \times 3^2) & \mathbf{b} = \lg(2^5 \times 3) & \mathbf{c} = \lg 9 - \lg 16 \\ = \lg 2 + 2 \lg 3 & = 5 \lg 2 + \lg 3 & = \lg 3^2 - \lg 2^4 \\ = a + 2b & = 5a + b & = 2 \lg 3 - 4 \lg 2 \\ & & = 2b - 4a \\ \mathbf{d} = \lg(2 \times 3) - \lg 2^3 & & = \lg(2 \times 3) - \lg 2^3 \\ = \lg 2 + \lg 3 - 3 \lg 2 & & = \lg 2 + \lg 3 - 3 \lg 2 \\ = \lg 3 - 2 \lg 2 & & = b - 2a \\ \mathbf{e} = \frac{1}{2} \lg 6 & \mathbf{f} = \frac{3}{2} \lg 2^4 + \frac{1}{2} \lg 3^4 & \mathbf{g} = 4 \lg 3 - 3(\lg 2 + \lg 3) \\ = \frac{1}{2}(\lg 2 + \lg 3) & = 6 \lg 2 + 2 \lg 3 & = \lg 3 - 3 \lg 2 \\ = \frac{1}{2}(a + b) & = 6a + 2b & = b - 3a \\ \mathbf{h} = \lg(6 \times 10) + \lg(2 \times 10) - 2 & & = \lg(6 \times 10) + \lg(2 \times 10) - 2 \\ = \lg 6 + 1 + \lg 2 + 1 - 2 & & = \lg 6 + 1 + \lg 2 + 1 - 2 \\ = \lg 2 + \lg 3 + \lg 2 & & = 2a + b \\ = 2a + b \end{array}$$

$$4 \quad \begin{array}{lll} \mathbf{a} = \log_5 10 - \log_5 2 & \mathbf{b} = \log_{12} 16 + \log_{12} 9 & \mathbf{c} = \log_4 8 \\ = \log_5 5 & = \log_{12} 144 & = \log_4 4^{\frac{3}{2}} \\ = 1 & = 2 & = \frac{3}{2} \\ \mathbf{d} = \frac{\log_7 3^4}{\log_7 3} & \mathbf{e} = \log_{27} \frac{12^3}{72^2} & \mathbf{f} = \frac{\log_{11} 5^2}{-\log_{11} 5} \\ = \frac{4 \log_7 3}{\log_7 3} & = \log_{27} \frac{12 \times 12 \times 12}{6 \times 12 \times 6 \times 12} & = \frac{2 \log_{11} 5}{-\log_{11} 5} \\ = 4 & = \log_{27} \frac{1}{3} = -\frac{1}{3} & = -2 \end{array}$$

$$5 \quad \begin{array}{lll} \mathbf{a} \quad x = 3^{1.8} & \mathbf{b} \quad x = 5^{-0.3} & \mathbf{c} \quad x - 3 = 8^{2.1} \\ x = 7.22 & x = 0.617 & x = 3 + 8^{2.1} \\ & & x = 81.8 \\ \mathbf{d} \quad \frac{1}{2}x + 1 = 4^{3.2} & \mathbf{e} \quad \log_2 3y = 5.3 & \mathbf{f} \quad \log_6(1 - 5t) = -0.6 \\ x = 2(4^{3.2} - 1) & 3y = 2^{5.3} & 1 - 5t = 6^{-0.6} \\ x = 167 & y = \frac{1}{3} \times 2^{5.3} & t = \frac{1}{5}(1 - 6^{-0.6}) \\ & y = 13.1 & t = 0.132 \end{array}$$

$$6 \quad \begin{array}{lll} \mathbf{a} = \log_2 x^5 & \mathbf{b} = \log_2(x^2 + 4x) & \mathbf{c} = \log_2 x^2 + \log_2 x \\ & & = \log_2 x^3 \\ \mathbf{d} = \log_2(x - 2)^3 - \log_2 x^4 & \mathbf{e} = \log_2 \frac{x^2 - 1}{x + 1} & \mathbf{f} = \log_2 x - 2 \log_2 x + \frac{2}{3} \log_2 x \\ = \log_2 \frac{(x - 2)^3}{x^4} & = \log_2 \frac{(x + 1)(x - 1)}{x + 1} & = -\frac{1}{3} \log_2 x \\ & = \log_2(x - 1) & = \log_2 x^{-\frac{1}{3}} \end{array}$$

7 a $\log_3 5x = \log_3 (2x + 3)$

$$5x = 2x + 3$$

$$x = 1$$

c $\log_4 \frac{x}{x-1} = \log_4 3 + \log_4 2 = \log_4 6$

$$\frac{x}{x-1} = 6$$

$$x = 6x - 6$$

$$x = \frac{6}{5}$$

e $\log_6 x^2 = \log_6 5(2x - 5)$

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

$$x^2 - 10x + 25 = 0$$

$$(x - 5)^2 = 0$$

$$x = 5$$

8 a $\log_x y = 2 \Rightarrow y = x^2$

sub. $x^3 = 27$
 $x = 3$
 $\therefore x = 3, y = 9$

c $\log_y 32 = -\frac{5}{2} \Rightarrow y^{-\frac{5}{2}} = 32$
 $\Rightarrow y = 32^{-\frac{2}{5}} = \frac{1}{4}$

sub. $\log_2 x = 3 - 2 \log_2 \frac{1}{4}$
 $\log_2 x = 3 - (-4) = 7$
 $x = 2^7 = 128$
 $\therefore x = 128, y = \frac{1}{4}$

e $\log_a x + \log_a 3 = \frac{1}{2} \log_a y \Rightarrow 3x = y^{\frac{1}{2}}$
 $\Rightarrow y = 9x^2$

sub. $3x + 9x^2 = 20$
 $9x^2 + 3x - 20 = 0$
 $(3x + 5)(3x - 4) = 0$
 for real $\log_a x, x > 0 \therefore x = \frac{4}{3}$
 $\therefore x = \frac{4}{3}, y = 16$

b $\log_9 10x = \frac{3}{2}$

$$10x = 9^{\frac{3}{2}} = 27$$

$$x = 2.7$$

d $\log_5 \frac{5x}{x+2} = \log_5 \frac{x+6}{x}$

$$\frac{5x}{x+2} = \frac{x+6}{x}$$

$$5x^2 = (x+2)(x+6) = x^2 + 8x + 12$$

$$x^2 - 2x - 3 = 0$$

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

$$x = -1, 3$$

$$\log_5 x \text{ not real for } x = -1 \therefore x = 3$$

f $\log_7 4x - \log_7 \frac{1}{x-6} = 1$

$$\log_7 4x(x-6) = 1$$

$$4x(x-6) = 7$$

$$4x^2 - 24x - 7 = 0$$

$$x = \frac{24 \pm \sqrt{576 + 112}}{8} = 3 \pm \frac{1}{2}\sqrt{43}$$

$$\log_7 4x \text{ not real for } x = 3 - \frac{1}{2}\sqrt{43}$$

$$\therefore x = 3 + \frac{1}{2}\sqrt{43} \quad [= 6.28 \text{ (3sf)}]$$

b $\log_5 x - 2 \log_5 y = \log_5 2 \Rightarrow \frac{x}{y^2} = 2$
 $\Rightarrow x = 2y^2$

sub. $3y^2 = 12$
 $y^2 = 4$
 for real $\log_5 y, y > 0 \therefore y = 2$
 $\therefore x = 8, y = 2$

d $\log_y x = \frac{3}{2} \Rightarrow y^{\frac{3}{2}} = x$
 $\Rightarrow y^{\frac{1}{2}} = x^{\frac{1}{3}}$

sub. $4x^{\frac{1}{3}} = 20$
 $x^{\frac{1}{3}} = 5$
 $x = 5^3 = 125$
 $\therefore x = 125, y = 25$

f $\log_{10} y + 2 \log_{10} x = 3 \Rightarrow x^2 y = 10^3$

$$\log_2 y - \log_2 x = 3 \Rightarrow \frac{y}{x} = 2^3$$

$$\Rightarrow y = 8x$$

sub. $8x^3 = 1000$
 $x^3 = 125$
 $x = 5$
 $\therefore x = 5, y = 40$

- 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 $(\frac{1}{2}x + 3) \lg 4 = (1 - 2x) \lg 5$ n $(3y - 2) \lg 2 = (2y + 5) \lg 3$
 $x(\frac{1}{2} \lg 4 + 2 \lg 5) = \lg 5 - 3 \lg 4$ $y(3 \lg 2 - 2 \lg 3) = 5 \lg 3 + 2 \lg 2$
 $x = \frac{\lg 5 - 3 \lg 4}{\frac{1}{2} \lg 4 + 2 \lg 5} = -0.652$ $y = \frac{5 \lg 3 + 2 \lg 2}{3 \lg 2 - 2 \lg 3} = -58.4$
- 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 $2(4^{2x}) - 7(4^x) + 3 = 0$
 $(2(4^x) - 1)(4^x - 3) = 0$
 $4^x = \frac{1}{2}, 3$
 $x = -\frac{1}{2}, \frac{\lg 3}{\lg 4} = -\frac{1}{2}, 0.79$

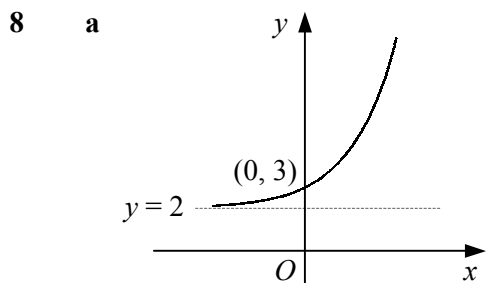
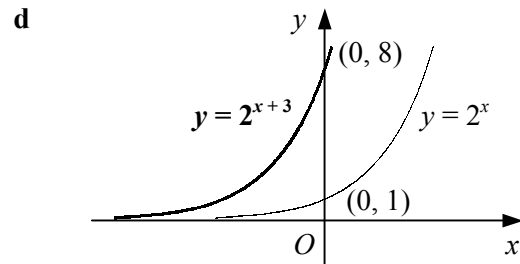
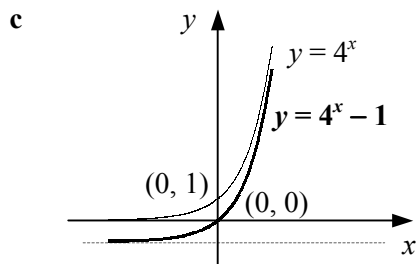
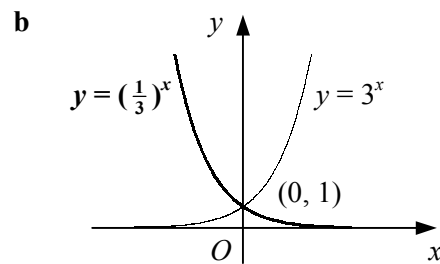
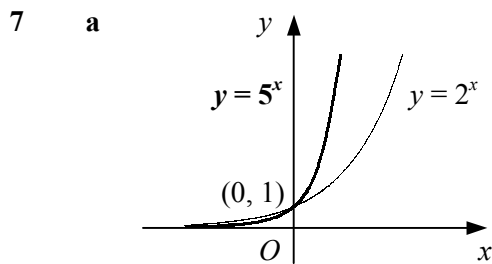
e $2(2^{2y}) + 7(2^y) - 15 = 0$
 $(2(2^y) - 3)(2^y + 5) = 0$
 $2^y = -5$ [no sols], $\frac{3}{2}$
 $y = \frac{\lg \frac{3}{2}}{\lg 2} = 0.58$

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