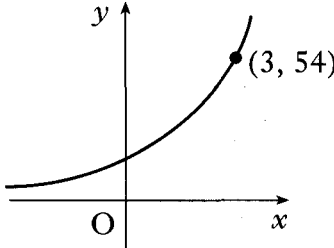
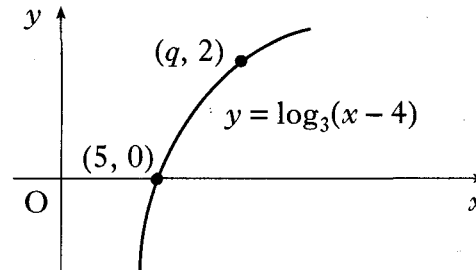
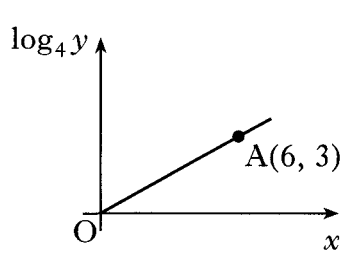
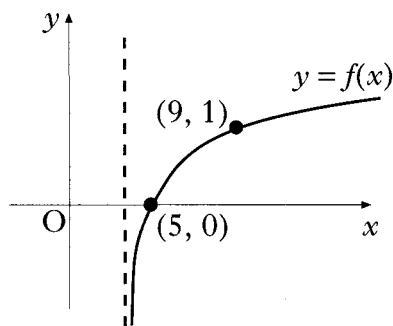


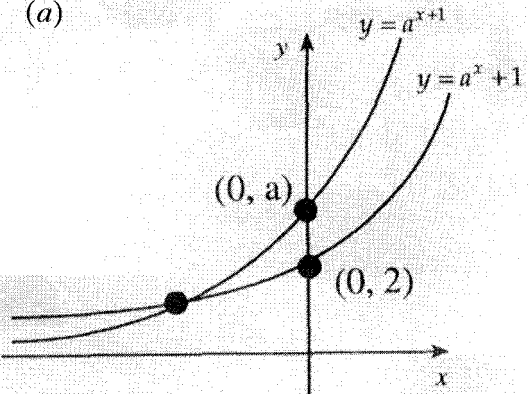
2008 P1	<p>19. The diagram shows part of the graph whose equation is of the form $y = 2m^x$. What is the value of m?</p>  <p>A 2 B 3 C 8 D 18</p>	2
Ans	B	
2008 P1	<p>20. The diagram shows part of the graph of $y = \log_3(x - 4)$. The point $(q, 2)$ lies on the graph.</p>  <p>What is the value of q?</p> <p>A 6 B 7 C 8 D 13</p>	2
Ans	D	

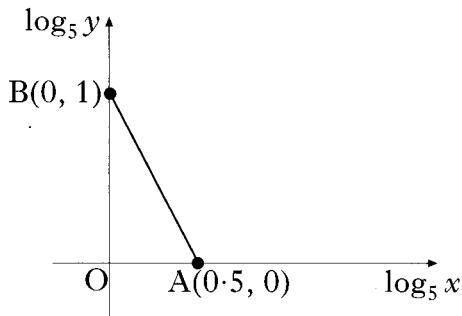
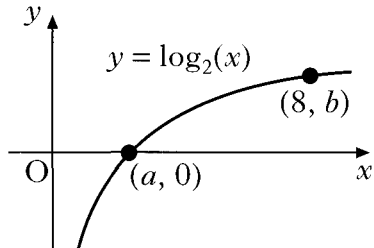
2008 P1	<p>23. Functions f, g and h are defined on suitable domains by</p> $f(x) = x^2 - x + 10, g(x) = 5 - x \text{ and } h(x) = \log_2 x.$ <p>(a) Find expressions for $h(f(x))$ and $h(g(x))$.</p> <p>(b) Hence solve $h(f(x)) - h(g(x)) = 3$.</p>	3 5
Ans	<p>(a) $h(f(x)) = \log_2(x^2 - x + 10)$ $h(g(x)) = \log_2(5 - x)$</p> <p>(b) $x = 3, -10$</p>	

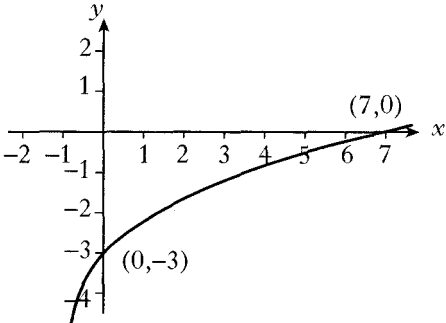
2007 P2	<p>8. The curve with equation $y = \log_3(x - 1) - 2 \cdot 2$, where $x > 1$, cuts the x-axis at the point $(a, 0)$.</p> <p>Find the value of a.</p>	4
Ans	12.2	
2007 P2	<p>11. Two variables x and y satisfy the equation $y = 3 \times 4^x$.</p> <p>(a) Find the value of a if $(a, 6)$ lies on the graph with equation $y = 3 \times 4^x$.</p> <p>(b) If $(-\frac{1}{2}, b)$ also lies on the graph, find b.</p> <p>(c) A graph is drawn of $\log_{10}y$ against x. Show that its equation will be of the form $\log_{10}y = Px + Q$ and state the gradient of this line.</p>	1 1 4
Ans	<p>(a) $a = \frac{1}{2}$ (c) $y = 3 \times 4^x$ $\log_{10}y = \log_{10}3 + \log_{10}(4^x)$ $= \log_{10}3 + x \log_{10}(4)$</p> <p>(b) $b = \frac{3}{2}$ So gradient of line = $\log_{10}(4)$</p>	
2006 P1	<p>10. Two variables, x and y, are connected by the law $y = a^x$. The graph of $\log_4 y$ against x is a straight line passing through the origin and the point A(6, 3). Find the value of a.</p>	4
Ans	 <p>$a = 2$</p>	

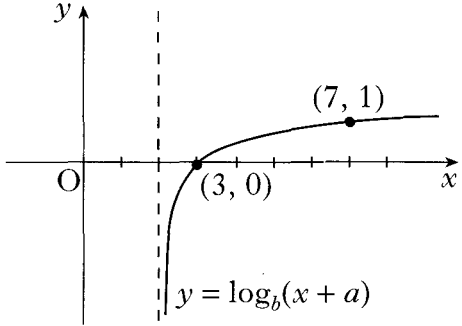
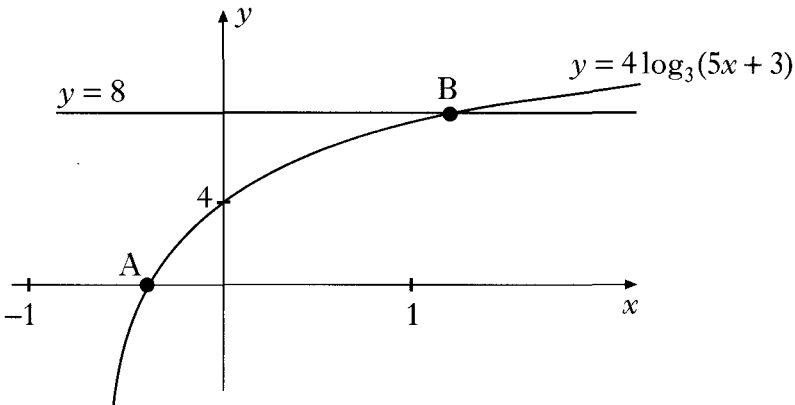
2006 P2	<p>11. It is claimed that a wheel is made from wood which is over 1000 years old.</p> <p>To test this claim, carbon dating is used.</p> <p>The formula $A(t) = A_0 e^{-0.000124t}$ is used to determine the age of the wood, where A_0 is the amount of carbon in any living tree, $A(t)$ is the amount of carbon in the wood being dated and t is the age of the wood in years.</p> <p>For the wheel it was found that $A(t)$ was 88% of the amount of carbon in a living tree.</p> <p>Is the claim true?</p>	5
Ans	$t = 1031$ years so claim valid	
2005 P1	<p>7. The function f is of the form $f(x) = \log_b(x - a)$.</p> <p>The graph of $y = f(x)$ is shown in the diagram.</p> <p>(a) Write down the values of a and b.</p> <p>(b) State the domain of f.</p>	2 1
Ans	<p>(a) $a = 4$ $b = 5$</p> <p>(b) domain is $x > 4$</p>	
2005 P2	<p>7. Solve the equation $\log_4(5 - x) - \log_4(3 - x) = 2, x < 3$.</p>	4
Ans	$x = \frac{43}{15}$	
2005 P2	<p>9. The value V (in £ million) of a cruise ship t years after launch is given by the formula $V = 252e^{-0.06335t}$.</p> <p>(a) What was its value when launched?</p> <p>(b) The owners decide to sell the ship once its value falls below £20 million. After how many years will it be sold?</p>	1 4
Ans	<p>(a) 252 (£m)</p> <p>(b) $t = 40$</p>	
2004 P1	<p>9. Solve the equation $\log_2(x + 1) - 2\log_2(3) = 3$.</p>	4
Ans	$x = 71$	



2004 P2	<p>10. The amount A_t micrograms of a certain radioactive substance remaining after t years decreases according to the formula $A_t = A_0 e^{-0.002t}$, where A_0 is the amount present initially.</p> <p>(a) If 600 micrograms are left after 1000 years, how many micrograms were present initially?</p> <p>(b) The half-life of a substance is the time taken for the amount to decrease to half of its initial amount. What is the half-life of this substance?</p>	3 4
Ans	<p>(a) 4433</p> <p>(b) 347 years</p>	
2003 P1	<p>12. Simplify $3 \log_e(2e) - 2 \log_e(3e)$ expressing your answer in the form $A + \log_e B - \log_e C$ where A, B and C are whole numbers.</p>	4
Ans	<p>$1 + \log_e 8 - \log_e 9$</p>	
2003 P2	<p>11. (a) (i) Sketch the graph of $y = a^x + 1$, $a > 2$.</p> <p>(ii) On the same diagram, sketch the graph of $y = a^{x+1}$, $a > 2$.</p> <p>(b) Prove that the graphs intersect at a point where the x-coordinate is $\log_a\left(\frac{1}{a-1}\right)$.</p>	2 3
Ans	<p>(a)</p> 	<p>(b) $a^{x+1} = a^x + 1$</p> $a \times a^x - a^x = 1$ $(a - 1) \times a^x = 1$ $a^x = \frac{1}{a - 1}$ $x = \log_a \left(\frac{1}{a - 1} \right)$
2002W P1	<p>12. If $\log_a p = \cos^2 x$ and $\log_a r = \sin^2 x$, show that $pr = a$.</p>	3
Ans	<p>Alternative</p> <ul style="list-style-type: none"> • $\log_a p + \log_a r = \cos^2 x + \sin^2 x$ • $\log_a p + \log_a r = \log_a pr$ • $\log_a pr = 1$ and so $pr = a$ <ul style="list-style-type: none"> • $p = a^{\cos^2 x}$ $r = a^{\sin^2 x}$ • $pr = a^{\cos^2 x + \sin^2 x}$ • $pr = a^1 = a$ 	

2002W P2	<p>9. A researcher modelled the size N of a colony of bacteria t hours after the beginning of her observations by $N(t) = 950 \times (2.6)^{0.2t}$.</p> <p>(a) What was the size of the colony when observations began?</p> <p>(b) How long does it take for the size of the colony to be multiplied by 10?</p>	1 4	
Ans	<p>(a) 950</p> <p>(b) approx 12 hours</p>		
2002 P1	<p>11. The graph illustrates the law $y = kx^n$. If the straight line passes through $A(0.5, 0)$ and $B(0, 1)$, find the values of k and n.</p>		4
Ans	<p>$\log_5 y = -2(\log_5 x) + 1$ $\log_5 y = \log_5 x^{-2} + \log_5 5$ $\log_5 y = \log_5 5x^{-2}$ $k = 5, n = -2$ $(y = 5x^{-2})$</p>		
2002 P2	<p>7. Find the x-coordinate of the point where the graph of the curve with equation $y = \log_3(x - 2) + 1$ intersects the x-axis.</p>	3	
Ans	<p>$\log_3(x - 2) = -1$ $x = 2\frac{1}{3}$</p>		
2001 P1	<p>8. Find x if $4 \log_x 6 - 2 \log_x 4 = 1$.</p>	3	
Ans	<p>$x = 81$</p>		
2001 P1	<p>10. The diagram shows a sketch of part of the graph of $y = \log_2(x)$.</p> <p>(a) State the values of a and b.</p> <p>(b) Sketch the graph of $y = \log_2(x + 1) - 3$.</p>		1 3

Ans	<p>(b) </p> <p>(a) $a = 1, b = 3$</p>	
2001 P2	<p>9. Before a forest fire was brought under control, the spread of the fire was described by a law of the form $A = A_0 e^{kt}$ where A_0 is the area covered by the fire when it was first detected and A is the area covered by the fire t hours later.</p> <p>If it takes one and half hours for the area of the forest fire to double, find the value of the constant k.</p>	3
Ans	$k = 0.46$	
2000 P1	<p>9. Evaluate $\log_5 2 + \log_5 50 - \log_5 4$.</p>	3
Ans	2	
2000 P2	<p>11. The results of an experiment give rise to the graph shown.</p> <p>(a) Write down the equation of the line in terms of P and Q.</p> <div> </div> <p>It is given that $P = \log_e p$ and $Q = \log_e q$.</p> <p>(b) Show that p and q satisfy a relationship of the form $p = aq^b$, stating the values of a and b.</p>	2 4
Ans	<p>(a) $P = 0.6Q + 1.8$</p> <p>(b) $a = 6.05, b = 0.6$</p>	
Specimen 2 P2	<p>7. The intensity I_t of light is reduced as it passes through a filter according to the law $I_t = I_0 e^{-kt}$ where I_0 is the initial intensity and I_t is the intensity after passing through a filter of thickness t cm. k is a constant.</p> <p>(a) A filter of thickness 4 cm reduces the intensity from 120 candle-power to 90 candle-power. Find the value of k.</p> <p>(b) The light is passed through a filter of thickness 10 cm. Find the percentage reduction in its intensity.</p>	4 3

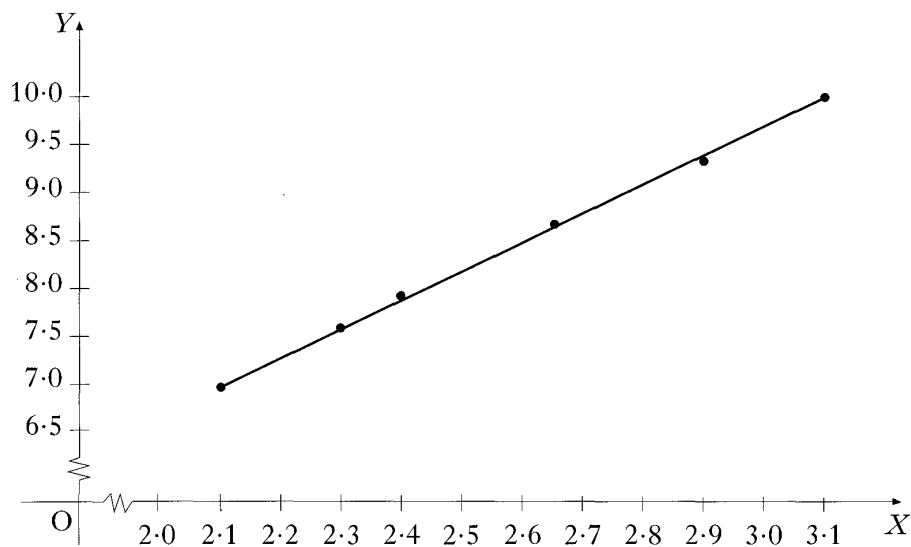
Ans	<p>(a) $90 = 120e^{-4k} \Rightarrow e^{-4k} = 0.75$ $-4k = \ln 0.75 \Rightarrow k = 0.0719$</p> <p>(b) $I_{10} = I_0 e^{-10 \times 0.0719}$ $\frac{I_{10}}{I_0} = 0.487$ so a 51.3% reduction</p>	
Specimen 2 P2	<p>8. The diagram shows part of the graph of $y = \log_b(x + a)$. Determine the values of a and b.</p>  <p>The diagram shows a Cartesian coordinate system with a vertical dashed line representing a vertical asymptote at $x = -2$. The graph of the logarithmic function $y = \log_b(x + a)$ is shown in the first quadrant. The curve passes through the point $(3, 0)$ on the x-axis and the point $(7, 1)$. The origin is labeled O.</p>	3
Ans	<p>translation $\Rightarrow a = -2$ $(7, 1) \Rightarrow 1 = \log_b(7 - 2) \Rightarrow b = 5$</p>	
Specimen 1 P1	<p>10. Part of the graph of $y = 4 \log_3(5x + 3)$ is shown in the diagram. This graph crosses the x-axis at the point A and the straight line $y = 8$ at the point B. Find the x-coordinate of B.</p>  <p>The diagram shows a Cartesian coordinate system. The graph of the logarithmic function $y = 4 \log_3(5x + 3)$ is shown. The curve has a vertical asymptote at $x = -0.6$. It crosses the x-axis at point A, which is located between $x = -1$ and $x = 0$. The curve also intersects the horizontal line $y = 8$ at point B. The x-axis has tick marks at -1 and 1. The y-axis has a tick mark at 4.</p>	3
Ans	<p>$\frac{6}{5}$</p>	

10. Six spherical sponges were dipped in water and weighed to see how much water each could absorb. The diameter (x millimetres) and the gain in weight (y grams) were measured and recorded for each sponge. It is thought that x and y are connected by a relationship of the form $y = ax^b$.

By taking logarithms of the values of x and y , the table below was constructed.

$X (= \log_e x)$	2.10	2.31	2.40	2.65	2.90	3.10
$Y (= \log_e y)$	7.00	7.60	7.92	8.70	9.38	10.00

A graph was drawn and is shown below.



Find the equation of the line in the form $Y = mX + c$.

Ans $Y = 3X + 0.7$