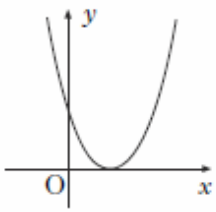
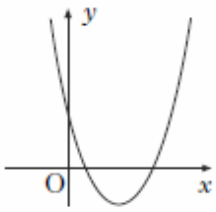
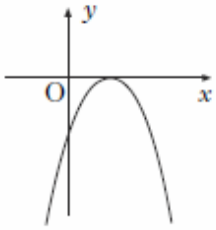
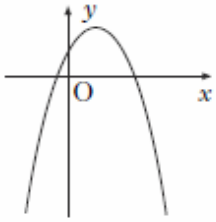
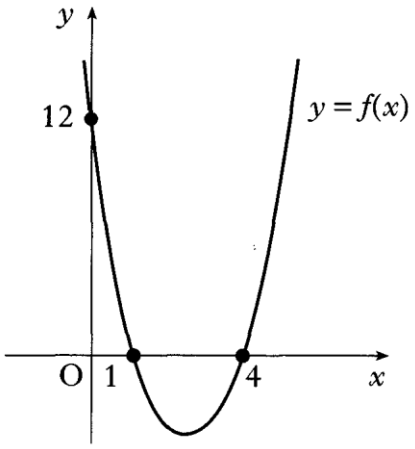
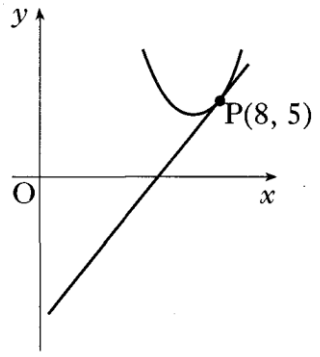
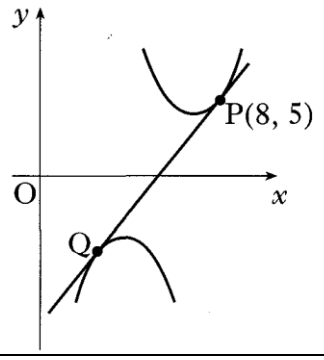
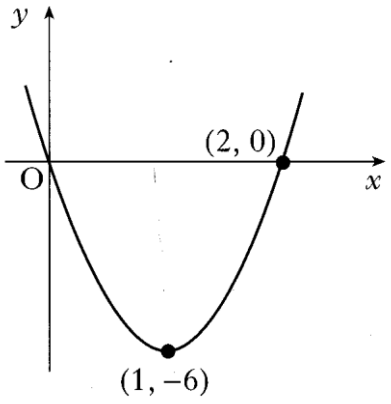
2010 P1	**5.** When $x^2 + 8x + 3$ is written in the form $(x + p)^2 + q$, what is the value of q? A –19 B –13 C –5 D 19	
Ans	B	
2010 P1	**6.** The roots of the equation $kx^2 - 3x + 2 = 0$ are equal. What is the value of k? A $-\frac{9}{8}$ B $-\frac{8}{9}$ C $\frac{8}{9}$ D $\frac{9}{8}$	
Ans	D	

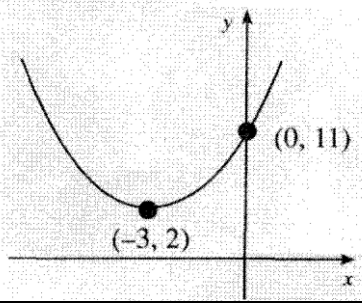
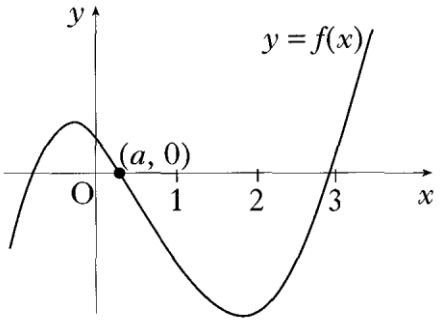
2010 P1	**13.** Which of the following diagrams shows a parabola with equation $y = ax^2 + bx + c$, where • $a > 0$ • $b^2 - 4ac > 0$? A  B  C  D 
Ans	B
2010 P1	**18.** What is the solution of $x^2 + 4x > 0$, where x is a real number? A $-4 < x < 0$ B $x < -4, x > 0$ C $0 < x < 4$ D $x < 0, x > 4$
Ans	B
2009 P1	**12.** A function f is given by $f(x) = 2x^2 - x - 9$. Which of the following describes the nature of the roots of $f(x) = 0$? A No real roots B Equal roots C Real distinct roots D Rational distinct roots

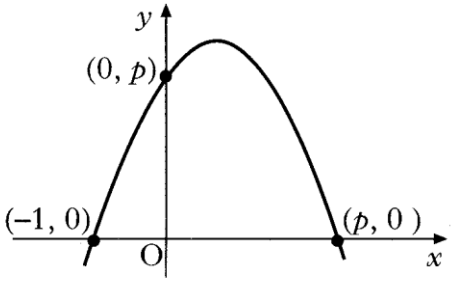
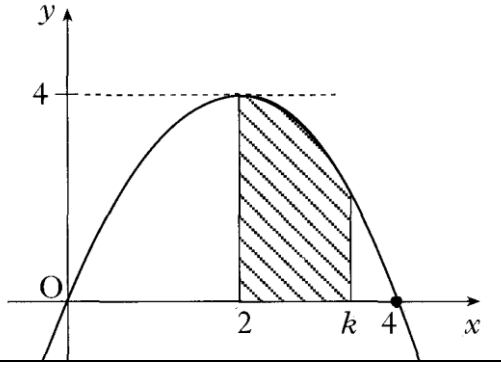
Ans	C	
2009 P1	**19.** For what values of x is $6 + x - x^2 < 0$? A $x > 3$ only B $x < -2$ only C $x < -2, x > 3$ D $-3 < x < 2$	
Ans	C	
2008 P1	**10.** Here are two statements about the roots of the equation $x^2 + x + 1 = 0$: (1) the roots are equal; (2) the roots are real. Which of the following is true? A Neither statement is correct. B Only statement (1) is correct. C Only statement (2) is correct. D Both statements are correct.	2
Ans	A	
2008 P1	**13.** The diagram shows part of the graph of a quadratic function $y = f(x)$. The graph has an equation of the form $y = k(x - a)(x - b)$.  What is the equation of the graph? A $y = 3(x - 1)(x - 4)$ B $y = 3(x + 1)(x + 4)$ C $y = 12(x - 1)(x - 4)$ D $y = 12(x + 1)(x + 4)$	2
Ans	A	

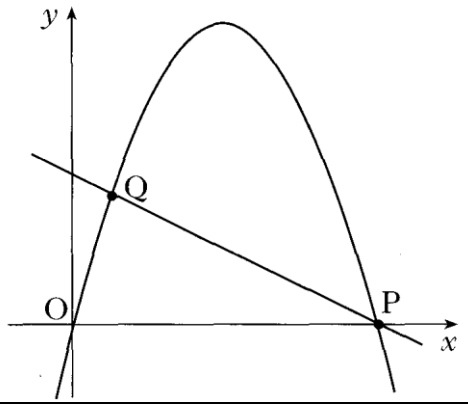
2008 P1	**16.** $2x^2 + 4x + 7$ is expressed in the form $2(x + p)^2 + q$. What is the value of q? A 5 B 7 C 9 D 11	2
Ans	A	

2007 P1	**4.** Find the range of values of k such that the equation $kx^2 - x - 1 = 0$ has no real roots.	4
Ans	$k < -\frac{1}{4}$	
2006 P1	**8.** (*a*) Express $2x^2 + 4x - 3$ in the form $a(x + b)^2 + c$. (*b*) Write down the coordinates of the turning point on the parabola with equation $y = 2x^2 + 4x - 3$.	3 1
Ans	(*a*) $2(x + 1)^2 - 5$ (*b*) $(-1, -5)$	
2006 P2	**2.** Find the value of k such that the equation $kx^2 + kx + 6 = 0$, $k \neq 0$, has equal roots.	4
Ans	$k = 24$	

2006 P2	**3.** The parabola with equation $y = x^2 - 14x + 53$ has a tangent at the point P(8, 5). (*a*) Find the equation of this tangent.  (*b*) Show that the tangent found in (*a*) is also a tangent to the parabola with equation $y = -x^2 + 10x - 27$ and find the coordinates of the point of contact Q. 	4 5
Ans	(*a*) $y - 5 = 2(x - 8)$ (*b*) Q = (4, –3)	
2004 P1	**8.** (*a*) Write $x^2 - 10x + 27$ in the form $(x + b)^2 + c$. (*b*) Hence show that the function $g(x) = \frac{1}{3}x^3 - 5x^2 + 27x - 2$ is always increasing.	2 4
Ans	(*a*) $(x - 5)^2 + 2$ (*b*) $g'(x) = x^2 - 10x + 27$ $= (x - 5)^2 + 2$ $g'(x) > 0$ for all x and so $g(x)$ is always increasing.	
2004 P1	**11.** The diagram shows a parabola passing through the points (0, 0), (1, –6) and (2, 0). (*a*) The equation of the parabola is of the form $y = ax(x - b)$. Find the values of a and b. 	3
Ans	(*a*) $a = 6, b = 2$ (*b*) $f(x) = 2x^3 - 6x^2 + 8$	

2004 P2	**3.** Prove that the roots of the equation $2x^2 + px - 3 = 0$ are real for all values of p.	4
Ans	$b^2 - 4ac = p^2 - 4 \times 2 \times (-3)$ $= p^2 + 24$ p^2 is positive, so $b^2 - 4ac$ is positive too and roots are real.	
2003 P1	**2.** (*a*) Write $f(x) = x^2 + 6x + 11$ in the form $(x + a)^2 + b$. (*b*) Hence or otherwise sketch the graph of $y = f(x)$.	2 2
Ans	(*a*) $(x + 3)^2 + 2$ (*b*) 	
2003 P1	**7.** Show that the line with equation $y = 2x + 1$ does not intersect the parabola with equation $y = x^2 + 3x + 4$.	5
Ans	$x^2 + 3x + 4 = 2x + 1$ $x^2 + x + 3 = 0$ $b^2 - 4ac = -11$ $b^2 - 4ac < 0$ therefore no intersection	
2002W P2	**6.** The graph of $f(x) = 2x^3 - 5x^2 - 3x + 1$ has been sketched in the diagram shown. Find the value of a correct to one decimal place. 	3
Ans	Evaluate $f(0{\cdot}1)$ and $f(0{\cdot}5)$, for example, to start with $a = 0{\cdot}2$	
2002 P1	**7.** (*a*) Express $f(x) = x^2 - 4x + 5$ in the form $f(x) = (x - a)^2 + b$.	2
Ans	(*a*) $f(x) = (x-2) + 1$	
2002 P2	**9.** Show that the equation $(1 - 2k)x^2 - 5kx - 2k = 0$ has real roots for all integer values of k.	5

Ans	discriminant $= (-5k)^2 - 4(1-2k)(-2k)$ $= 9k^2 + 8k$ for real roots, discriminant ≥ 0 ie $9k^2 + 8k \geq 0$ $k(9k+8) \geq 0$ $k \geq 0$ or $k \leq \frac{-8}{9}$ no integers between 0 and $\frac{-8}{9}$ hence no integral values of k give non - real roots	
2001 P1	**2.** For what value of k does the equation $x^2 - 5x + (k+6) = 0$ have equal roots?	3
Ans	$k = \frac{1}{4}$	
2001 P1	**4.** Given $f(x) = x^2 + 2x - 8$, express $f(x)$ in the form $(x+a)^2 - b$.	2
Ans	$(x+1)^2 - 9$	
2001 P2	**11.** The diagram shows a sketch of a parabola passing through $(-1, 0)$, $(0, p)$ and $(p, 0)$. (*a*) Show that the equation of the parabola is $y = p + (p-1)x - x^2$. (*b*) For what value of p will the line $y = x + p$ be a tangent to this curve? 	3 3
Ans	(*a*) $y = k(x+1)(x-p)$ $k = -1$ with justification ie substitute $(0,p)$ $y = -1(x+1)(x-p)$ and complete (*b*) 2	
2000 P2	**4.** The parabola shown crosses the x-axis at (0, 0) and (4, 0), and has a maximum at (2, 4). The shaded area is bounded by the parabola, the x-axis and the lines $x = 2$ and $x = k$. (*a*) Find the equation of the parabola. 	2
Ans	(*a*) $y = 4x - x^2$	

Specimen 2 P2	**1.** The parabola shown in the diagram has equation $y = 4x - x^2$ and intersects the x-axis at the origin and P. The line PQ has equation $2y + x = 4$. Find the coordinates of P and Q. 	5
Ans	$4x - x^2 = 2 - \frac{1}{2}x \Rightarrow 2x^2 - 9x + 4 = 0$ $x = \frac{1}{2}, x = 4 \Rightarrow \text{P} = (4,0),\ \text{Q} = \left(\frac{1}{2}, \frac{7}{4}\right)$	
Specimen 1 P2	**3.** (*a*) Show that the function $f(x) = 2x^2 + 8x - 3$ can be written in the form $f(x) = a(x + b)^2 + c$ where a, b and c are constants. (*b*) Hence, or otherwise, find the coordinates of the turning point of the function f.	3 1
Ans	(*a*) $2(x + 2)^2 - 11$ (*b*) $(-2, -11)$	
Specimen 1 P2	**8.** The roots of the equation $(x - 1)(x + k) = -4$ are equal. Find the values of k.	5
Ans	$-5,\ 3$	