

The Discriminant Exam Questions MS (from OCR 4721)

Q1, (Specimen Q3)

(i) Discriminant is $k^2 - 4k$	M1 A1	2	For attempted use of the discriminant For correct expression (in any form)
(ii) For no real roots, $k^2 - 4k < 0$ Hence $k(k - 4) < 0$ So $0 < k < 4$	M1 M1 A1 A1	4	For stating their $\Delta < 0$ For factorising attempt (or other soln method) For both correct critical values 0 and 4 seen For correct pair of inequalities
		6	

Q2, (Jun 2007, Q4)

(i) $(-4)^2 - 4 \times k \times k$ $= 16 - 4k^2$	M1 A1	2	Uses $b^2 - 4ac$ (involving k) $16 - 4k^2$
(ii) $16 - 4k^2 = 0$ $k^2 = 4$ $k = 2$ or $k = -2$	M1 B1 B1	3	Attempts $b^2 - 4ac = 0$ (involving k) or attempts to complete square (involving k)
		5	

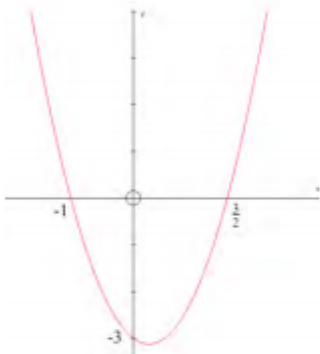
Q3, (Jan 2010, Q10)

$(-30)^2 - 4 \times k \times 25k = 0$	M1		Attempts $b^2 - 4ac$ involving k
$900 - 100k^2 = 0$	M1		States their discriminant = 0
$k = 3$ or $k = -3$	B1 B1	4	
		4	

Q4, (Jan 2013, Q8)

$(3k - 1)^2 - 4 \times k \times -4$	*M1	Attempts $b^2 - 4ac$ or an equation or inequality involving b^2 and $4ac$. Must involve k^2 in first term (but no x anywhere). If $b^2 - 4ac$ not stated, must be clear attempt.	Must be working with the discriminant explicitly and not only as part of the quadratic formula. Allow $\sqrt{b^2 - 4ac}$ for first M1 A1
$= 9k^2 + 10k + 1$	A1	Correct discriminant, simplified to 3 terms	
$9k^2 + 10k + 1 < 0$	M1	States discriminant < 0 or $b^2 < 4ac$.	Can be awarded at any stage. Doesn't need first M1. No square root here.
$(9k + 1)(k + 1) < 0$	DM1	Correct method to find roots of a three term quadratic	
$-1, -\frac{1}{9}$	A1	Both values of k correct	
$-1 < k < -\frac{1}{9}$	M1	Chooses "inside region" of inequality	Allow correct region for their inequality
	A1	Allow " $k < -\frac{1}{9}$ and $k > -1$ " etc. must be strict inequalities for A mark	Do not allow " $k < -\frac{1}{9}$ or $k > -1$ ";
	[7]		

Q5, (Jun 2015, Q8)

(i)	$(2x - 3)(x + 1) = 0$	M1	Correct method to find roots – see appendix 1
	$x = \frac{3}{2}, x = -1$	A1	Correct roots
		A1ft	Good curve: <ul style="list-style-type: none"> • Correct shape, symmetrical positive quadratic • Minimum point in the correct quadrant for their roots (ft) • their x intercepts correctly labelled (ft)
		B1	y intercept at $(0, -3)$. Must have a graph.
		[4]	
(ii)	$x < -1, x > \frac{3}{2}$	M1	Chooses the “outside region”
		A1ft	Follow through x -values in (i). Allow “ $x < -1, x > \frac{3}{2}$ ”, “ $x < -1$ or $x > \frac{3}{2}$ ” but do not allow “ $x < -1$ and $x > \frac{3}{2}$ ”
		[2]	
(iii)	$b^2 - 4ac = 1^2 - 4 \times 2 \times -(3 + k)$	M1	Rearrangement and use of $b^2 - 4ac < 0$, must involve 3 and k in constant term (not $3k$)
	$25 + 8k < 0$	A1	$p + 8k < 0$ oe found, any constant p . p need not be simplified
	$k < -\frac{25}{8}$	A1	Correct final answer
		[3]	

Q6, (Jun 2016, Q9)

$$x^2 + (2 - 2k)x + 11 + k = 0$$

$$(2 - 2k)^2 - 4(11 + k)$$

$$4k^2 - 12k - 40 > 0$$

$$k^2 - 3k - 10 > 0$$

$$(k - 5)(k + 2)$$

$$k < -2, k > 5$$

M1*	Attempt to rearrange to a three-term quadratic
M1dep*	Uses $b^2 - 4ac$, involving k and not involving x
A1	Correct simplified inequality obtained www
M1dep*	Correct method to find roots of 3-term quadratic
A1	5 and -2 seen as roots
M1dep*	$b^2 - 4ac > 0$ and chooses “outside region”
A1	Fully correct, strict inequalities.
[7]	