The Discriminant Exam Questions MS (from OCR 4721)

Q1, (Specimen Q3)

(i) Discriminant is $k^2 - 4k$	M1		For attempted use of the discriminant
	A1	**2**	For correct expression (in any form)
(ii) For no real roots, $k^2 - 4k < 0$	M1		For stating their $\Delta < 0$
Hence $k(k-4) < 0$	M1		For factorising attempt (or other soln method)
So $0 < k < 4$	A1		For both correct critical values 0 and 4 seen
	A1	**4**	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)	$16 - 4k^2 = 0$	M1	Attempts $b^2 - 4ac = 0$ (involving k) or attempts to complete square (involving k)
	$k^2 = 4$		
	$k = 2$	B1	
	or $k = -2$	B1 3	
		5	

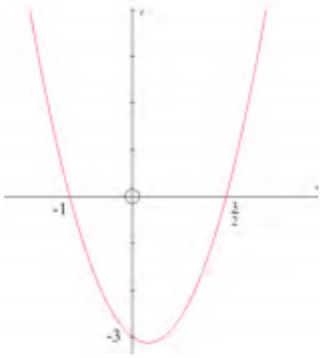
Q3, (Jan 2010, Q10)

$(-30)^2 - 4 \times k \times 25k = 0$	**M1**		Attempts $b^2 - 4ac$ involving k
$900 - 100k^2 = 0$	**M1**		States their discriminant = 0
$k = 3$	**B1**		
or $k = -3$	**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 [7]	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";

Q5, (Jun 2015, Q8)

(i)	$(2x-3)(x+1)=0$ $x=\frac{3}{2}, x=-1$  	M1 A1 A1**ft** B1 **[4]**	Correct method to find roots – **see appendix 1** Correct roots Good curve: • Correct shape, symmetrical positive quadratic • Minimum point in the correct quadrant for their roots **(ft)** • their x intercepts correctly labelled **(ft)** y intercept at (0, −3). Must have a graph.
(ii)	$x<-1, x>\frac{3}{2}$	M1 A1**ft** **[2]**	Chooses the "outside region" 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** $x>\frac{3}{2}$"
(iii)	$b^2-4ac=1^2-4\times2\times-(3+k)$ $25+8k<0$ $k<-\frac{25}{8}$	M1 A1 A1 **[3]**	Rearrangement and use of $b^2-4ac<0$, must involve 3 and k in constant term (not $3k$) $p+8k<0$ oe found, any constant p. p need not be simplified Correct final answer

Q6, (Jun 2016, Q9)

$x^2+(2-2k)x+11+k=0$	**M1***	Attempt to rearrange to a three-term quadratic
$(2-2k)^2-4(11+k)$	**M1dep***	Uses b^2-4ac, involving k and not involving x
$4k^2-12k-40>0$	**A1**	Correct simplified inequality obtained **www**
$k^2-3k-10>0$		
$(k-5)(k+2)$	**M1dep***	Correct method to find roots of 3-term quadratic
	A1	5 and – 2 seen as roots
$k<-2, k>5$	**M1dep***	$b^2-4ac>0$ and chooses "outside region"
	A1	Fully correct, strict inequalities.
	[7]	