Question		Answer	Marks	AO	Guidance
9		**DR** For equal magnitude areas, total area $= 0$	**M1**	**3.1a**	Sets up the problem solving step. May be awarded at any stage when this is used
		$\int_0^k (x^2 - 3x)\mathrm{d}x = 0$			
		$\left[\frac{x^3}{3} - \frac{3x^2}{2}\right]_0^k = 0$	**M1***	**2.1**	Attempt to integrate
			A1	**1.1**	Correct integral, ignore limits
		$\left(\frac{k^3}{3} - \frac{3k^2}{2}\right) - 0 = 0$	**M1(dep)**	**2.1**	Use of limits seen to form equation for k
		$\frac{1}{6}k^2(2k - 9) = 0$	**B1**	**1.1**	Correct factors seen www Allow for another algebraic method of solving seen eg $2k - 9 = 0$ or $\frac{k}{3} - \frac{3}{2} = 0$ seen
		So $k = \frac{9}{2}$ [or $k = 0$]	**A1**	**1.1**	Cao. Ignore wrong or missing reference to $k = 0$
		Alternative method			
		$\int_0^3 (x^2 - 3x)\mathrm{d}x = \left[\frac{x^3}{3} - \frac{3x^2}{2}\right]_0^3 \quad \left[= -\frac{9}{2}\right]$	**M1***		Attempt to find $\int (x^2 - 3x)\mathrm{d}x$
			A1		Correct integral, ignore limits
		So $\left[\frac{x^3}{3} - \frac{3x^2}{2}\right]_3^k = \left(\frac{k^3}{3} - \frac{3k^2}{2}\right) - \left(-\frac{9}{2}\right)$	**M1(dep)**		Correct use of limits for the second integral used to form expression for second area in terms of k. Must be from $\int (x^2 - 3x)\mathrm{d}x$
		$\frac{k^3}{3} - \frac{3k^2}{2} + \frac{9}{2} = \frac{9}{2}$	**M1**		Equate their expression to magnitude of the first integral to form an equation for k. This mark is not dependent on previous marks.
		$\frac{1}{6}k^2(2k - 9) = 0$	**B1**		Correct factors seen www Allow for another algebraic method of solving seen eg $2k - 9 = 0$ or $\frac{k}{3} - \frac{3}{2} = 0$ seen
		So $k = \frac{9}{2}$	**A1**		Cao. Ignore wrong or missing reference to $k = 0$
			[6]		