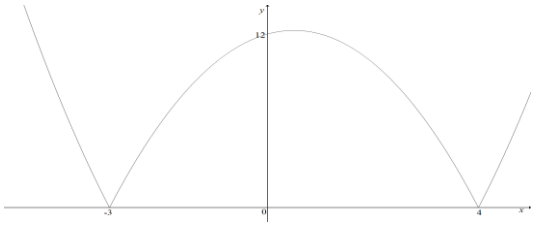
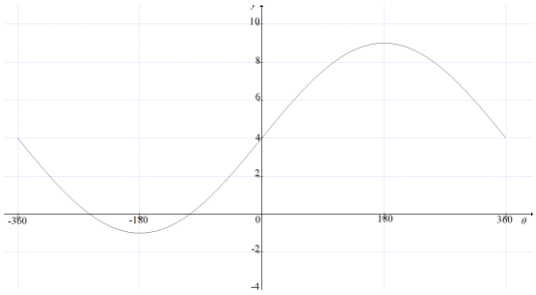
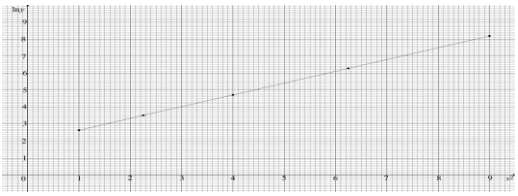
Question	Answer	Marks	Guidance
1(a)	$y = x^2 - x - 12$ $\frac{dy}{dx} = 2x - 1$ or $(x+3)+(x-4)$ or $y = \left(x - \frac{1}{2}\right)^2 - \frac{49}{4}$ or using symmetry $x = \frac{4-3}{2}$	**M1**	For expanding the brackets and differentiate with at least one correct term or for using the product rule or for completing the square or for using symmetry
	$x = \frac{1}{2}$	**A1**	
	$y = -\frac{49}{4}$ oe	**A1**	
1(b)		**2**	**B1** for the correct shape. Must have the parabola part of the curve with maximum in the first quadrant and cusps on the *x*-axis. Ignore labelling of their maximum point if incorrect coordinates **B1** for correct intercepts. Must be correct shape
1(c)	$k > \frac{49}{4}$ oe	**B1**	**FT** on $\left\lvert \textit{their } -\frac{49}{4} \right\rvert$ excluding $k > 12$
2		**4**	**B1** for correct shape must be a curve with one min in 3rd quadrant and one max in first quadrant and correct endpoints $(-360, 4)$ and $(360, 4)$ Ignore labelling of their maximum point if incorrect coordinates. **depB1** for intercept of 4 on *y*-axis. Must have the correct shape **depB1** for max in correct position of $(180^o,\ 9)$. Must have the correct shape **depB1** for min in correct position of $(-180^o,\ -1)$. Must have the correct shape
3	$4x^2 - 4kx - k + 2 [= 0]$	**B1**	soi
	$k^2 + k - 2$ Critical values $-2,\ 1$	**2**	**M1** for use of discriminant on *their* three-term quadratic equation to obtain two critical values
	$-2 < k < 1$	**A1**	Strict inequality

Question	Answer	Marks	Guidance
4(a)	$3 = \log_2 8$	**B1**	
	$\log_2 \frac{8a^4}{b}$	**2**	**M1** for correct use of two operations from multiplication, division or power rule for logs to the base of 2. **A1** for log to the base of 2 only
4(b)	$\lg x = \frac{4}{\lg x}$ or $\frac{1}{\log_x 10} = 4\log_x 10$	**B1**	Change of base
	$(\lg x)^2 = 4$ or $(\log_x 10)^2 = \frac{1}{4}$	**B1**	Dep on correct change of base Must work with $(\lg x)^2$ or $(\log_x 10)^2$ not $\log x^2$ or $(\log_x 100)$
	$x = 100$	**B1**	Dep on correct change of base
	$x = \frac{1}{100}$ or 0.01	**B1**	Dep on correct change of base
5(a)	$\mathrm{p}(-2): -8a + 4b + 38 + c = 0$	**M1**	For substitution of -2 in p(x) and equating to zero. Allow one sign error in evaluating
	$\mathrm{p}(-1): -a + b + 19 + c = 20$	**M1**	For substitution of -1 in p(x) and equating to 20. Allow one sign error in evaluating
	$7a - 3b = 39$	**A1**	AG – must be from correct work
5(b)	$\mathrm{p}'(1): 3a + 2b - 19 = 1$	**M1**	For substitution of 1 in $\mathrm{p}'(x)$ and equating to 1 Allow one sign error in evaluating. Can be unsimplified
	$a = 6,\ b = 1,\ c = 6$	**2**	**M1 dep** for solution of *their* equation with that from **(a)** to find at least one unknown.
6(a)	<table><tr><td>x^2</td><td>1</td><td>2.25</td><td>4</td><td>6.25</td><td>9</td></tr><tr><td>ln y</td><td>2.64</td><td>3.51</td><td>4.72</td><td>6.28</td><td>8.18</td></tr></table>	**2**	**M1** for plotting points with one error