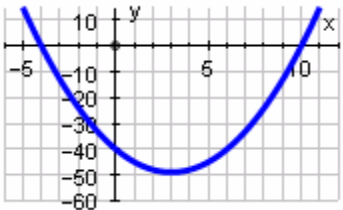
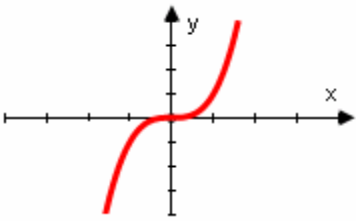


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<p>1</p>	$x^2 - 6x - 40 \geq 0$ $(x+4)(x-10) \geq 0$  $x \leq -4, \quad x \geq 10$	<p>M1</p> <p>A1</p> <p>M1</p> <p>A1 4 4</p>	<p>Correct method to find roots</p> <p>-4, 10</p> <p>Correct method to solve quadratic inequality e.g. +ve quadratic graph</p> <p>$x \leq -4, \quad x \geq 10$ (not wrapped, not strict inequalities, no 'and')</p>
<p>2(i)</p>	<p>EITHER</p> $3(x^2 + 4x) + 7$ $3(x+2)^2 - 12 + 7$ $3(x+2)^2 - 5$ <p>OR</p> $3(x^2 + 2ax + a^2) + b$ $3x^2 + 6ax + 3a^2 + b$ $6a = 12$ $a = 2$ $3a^2 + b = 7$ $b = -5$	<p>M1</p> <p>A1</p> <p>M1</p> <p>A1 4</p> <p>B1 ft 1 5</p>	$a = \frac{12}{6 \text{ or } 2}$ $a = 2$ $7 - a^2 \text{ or } 7 - 3a^2 \text{ or } \frac{7}{3} - a^2 \text{ (their } a)$ $b = -5$ $x = -2$
<p>3 (i)</p>		<p>B1 1</p>	<p>Correct sketch showing point of inflection at origin</p>
<p>(ii)</p>	<p>Reflection in x-axis or reflection in y-axis</p>	<p>B1</p> <p>B1 2</p>	<p>Reflection In x-axis or y=0 or y-axis or x=0</p>
<p>(iii)</p>	$y = (x - p)^3$	<p>M1</p> <p>A1 2 5</p>	$y = (x \pm p)^3$ $y = (x - p)^3$

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4	$k = x^3$ $k^2 + 26k - 27 = 0$ $k = -27, 1$ $x = -3, 1$	*M1 A1 A1 DM1 A1 5 5	Attempt a substitution to obtain a quadratic $k^2 + 26k - 27 = 0$ $-27, 1$ Attempt cube root $x = -3, 1$ (no extras) (SR: $x = 1$ seen www B1 $x = -3$ seen www B1)
5 (a)	$2x^{\frac{2}{3}} \times 3x^{-1}$ $= 6x^{\frac{-1}{3}}$ (b) $2^{40} \times 4^{30}$ $= 2^{40} \times 2^{60}$ $= 2^{100}$ (c) $\frac{26(4 + \sqrt{3})}{(4 - \sqrt{3})(4 + \sqrt{3})}$ $= 8 + 2\sqrt{3}$	M1 A1 2 M1 A1 2 M1 A1 A1 3 7	Adds indices $6x^{\frac{-1}{3}}$ 2^{60} or 4^{20} 2^{100} Multiply top and bottom by $(4 + \sqrt{3})$ or $(-4 - \sqrt{3})$ $(4 - \sqrt{3})(4 + \sqrt{3}) = 13$ $8 + 2\sqrt{3}$
6 (i)	$(x^2 + 2x + 1)(3x - 4)$ $= 3x^3 + 2x^2 - 5x - 4$ (ii) $9x^2 + 4x - 5$ (iii) $18x + 4$	M1 A1 A1 3 B1 ft B1 ft 2 M1 A1 ft 2 7	Expand 2 brackets to give an expression of the form $ax^2 + bx + c$ ($a \neq 0, b \neq 0, c \neq 0$) and attempt to multiply by third bracket $3x^3 + 2x^2 - 5x - 4$ 3 correct simplified terms Completely correct $9x^2 + 4x - 5$ 1 term correct Completely correct (3 terms) Attempt to differentiate their (ii) $18x + 4$ (2 terms) (SR (ii) $3ax^2 + 2bx + c$ B1 (iii) $6ax + 2b$ B1)

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<p>7 (i)</p> <p>$b^2 - 4ac$</p> <p>(a) $36 - 9 \times 4 = 0$</p> <p>(b) $100 - 48 = 52$</p> <p>(c) $4 - 20 = -16$</p> <p>(ii)</p> <p>(a) Fig 3</p> <p>(b) Fig 2</p> <p>(c) Fig 5</p> <p>(a) 1 root, touches x-axis once, line of symmetry $x = -3$ or root $x = -3$</p> <p>(b) 2 roots, meets x-axis twice, line of symmetry $x = 5$</p> <p>(c) No real roots, does not meet x-axis</p>	<p>M1</p> <p>A1</p> <p>A1 3</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>B1 4</p> <p>7</p>	<p>Uses $b^2 - 4ac$</p> <p>1 correct</p> <p>3 correct</p> <p>SR All 3 values correct but $\sqrt{\quad}$ used B1</p> <p>1 correct matching</p> <p>3 correct matchings</p> <p>1 correct comment relating roots to touching/crossing x-axis or about line of symmetry or vertex o.e. for one graph</p> <p>2 further correct comments about roots, line of symmetry o.e. for the other 2 graphs</p>
<p>8 (i)</p> <p>Circle, centre (0, 0), radius 5</p> <p>(ii)</p> <p>$y = 5 - 2x$</p> <p>$x^2 + (5 - 2x)^2 = 25$</p> <p>$5x^2 - 20x = 0$</p> <p>OR</p> <p>$x = \frac{5 - y}{2}$</p> <p>$\frac{(5 - y)^2}{4} + y^2 = 25$</p> <p>$y^2 - 2y - 15 = 0$</p> <p>$x = 0, 4$</p> <p>$y = 5, -3$</p>	<p>B1</p> <p>B1 2</p> <p>M1</p> <p>*M1</p> <p>DM1</p> <p>M1</p> <p>A1</p> <p>A1 6</p> <p>8</p>	<p>Circle centre (0, 0)</p> <p>Radius 5</p> <p>Attempt to solve equations simultaneously</p> <p>Substitute for x/y or correct attempt at elimination of one variable (NOT for 2 linear equations)</p> <p>Obtain quadratic $ax^2 + bx + c = 0$ ($a \neq 0, b \neq 0$)</p> <p>Correct method to solve quadratic</p> <p>$x = 0, 4$ or $y = 5, -3$</p> <p>$y = 5, -3$ or $x = 0, 4$</p> <p>SR one correct pair www B1</p> <p>SR</p> <p>If solution by graphical methods:</p> <p>Drawing circle, centre (0,0) radius 5 B1</p> <p>Drawing line B1</p> <p>Looking for intersection M1</p> <p>(0,5) correct A1</p> <p>(4, -3) correct A2</p>

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<p>9 (i)</p>	$y = \frac{4}{3}x + \frac{5}{3}$ <p>gradient = $\frac{4}{3}$</p>	<p>B1 1</p>	$\frac{4}{3}$ or 1.33 or better
<p>(ii)</p>	<p>gradient of</p> $\perp r = -\frac{3}{4}$ $y - 2 = -\frac{3}{4}(x - 1)$ $4y + 3x = 11$	<p>B1 ft M1 A1 A1 4</p>	$-\frac{3}{4}$ seen or implied Attempts equation of straight line through (1, 2) with any gradient $y - 2 = -\frac{3}{4}(x - 1)$ $3x + 4y - 11 = 0$ (not aef)
<p>(iii)</p>	$P\left(-\frac{5}{4}, 0\right)$ $Q\left(0, \frac{11}{4}\right)$ $\left(-\frac{5}{8}, \frac{11}{8}\right)$	<p>B1 B1 ft B1 ft 3</p>	$\left(-\frac{5}{4}, 0\right)$ seen or implied $\left(0, \frac{11}{4}\right)$ seen or implied (from a straight line equation in (ii)) $\left(-\frac{5}{8}, \frac{11}{8}\right)$ aef
<p>(iv)</p>	$\sqrt{\left(\frac{5}{4}\right)^2 + \left(\frac{11}{4}\right)^2}$ $\frac{\sqrt{146}}{4}$	<p>M1 A1 A1 3</p>	Correct method to find line length using Pythagoras' theorem $\sqrt{\left(\frac{5}{4}\right)^2 + \left(\frac{11}{4}\right)^2}$ $\frac{\sqrt{146}}{4}$
		<p>11</p>	

