

C1 ALGEBRA

Worksheet F

- 1 Express in the form $(x + a)^2 + b$
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|----------------------------|----------------------------------|-----------------------------------|---|
| a $x^2 + 2x + 4$ | b $x^2 - 2x + 4$ | c $x^2 - 4x + 1$ | d $x^2 + 6x$ |
| e $x^2 + 4x + 8$ | f $x^2 - 8x - 5$ | g $x^2 + 12x + 30$ | h $x^2 - 10x + 25$ |
| i $x^2 + 6x - 9$ | j $18 - 4x + x^2$ | k $x^2 + 3x + 3$ | l $x^2 + x - 1$ |
| m $x^2 - 18x + 100$ | n $x^2 - x - \frac{1}{2}$ | o $20 + 9x + x^2$ | p $x^2 - 7x - 2$ |
| q $5 - 3x + x^2$ | r $x^2 - 11x + 37$ | s $x^2 + \frac{2}{3}x + 1$ | t $x^2 - \frac{1}{2}x - \frac{1}{4}$ |
- 2 Express in the form $a(x + b)^2 + c$
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| a $2x^2 + 4x + 3$ | b $2x^2 - 8x - 7$ | c $3 - 6x + 3x^2$ | d $4x^2 + 24x + 11$ |
| e $-x^2 - 2x - 5$ | f $1 + 10x - x^2$ | g $2x^2 + 2x - 1$ | h $3x^2 - 9x + 5$ |
| i $3x^2 - 24x + 48$ | j $3x^2 - 15x$ | k $70 + 40x + 5x^2$ | l $2x^2 + 5x + 2$ |
| m $4x^2 + 6x - 7$ | n $-2x^2 + 4x - 1$ | o $4 - 2x - 3x^2$ | p $\frac{1}{3}x^2 + \frac{1}{2}x - \frac{1}{4}$ |
- 3 Solve each equation by completing the square, giving your answers as simply as possible in terms of surds where appropriate.
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| a $y^2 - 4y + 2 = 0$ | b $p^2 + 2p - 2 = 0$ | c $x^2 - 6x + 4 = 0$ | d $7 + 10r + r^2 = 0$ |
| e $x^2 - 2x = 11$ | f $a^2 - 12a - 18 = 0$ | g $m^2 - 3m + 1 = 0$ | h $9 - 7t + t^2 = 0$ |
| i $u^2 + 7u = 44$ | j $2y^2 - 4y + 1 = 0$ | k $3p^2 + 18p = -23$ | l $2x^2 + 12x = 9$ |
| m $-m^2 + m + 1 = 0$ | n $4x^2 + 49 = 28x$ | o $1 - t - 3t^2 = 0$ | p $2a^2 - 7a + 4 = 0$ |
- 4 By completing the square, find the maximum or minimum value of y and the value of x for which this occurs. State whether your value of y is a maximum or a minimum in each case.
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| a $y = x^2 - 2x + 7$ | b $y = x^2 + 2x - 3$ | c $y = 1 - 6x + x^2$ |
| d $y = x^2 + 10x + 35$ | e $y = -x^2 + 4x + 4$ | f $y = x^2 + 3x - 2$ |
| g $y = 2x^2 + 8x + 5$ | h $y = -3x^2 + 6x$ | i $y = 7 - 5x - x^2$ |
| j $y = 4x^2 - 12x + 9$ | k $y = 4x^2 + 20x - 8$ | l $y = 17 - 2x - 2x^2$ |
- 5 Sketch each curve showing the exact coordinates of its turning point and the point where it crosses the y -axis.
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| a $y = x^2 - 4x + 3$ | b $y = x^2 + 2x - 24$ | c $y = x^2 - 2x + 5$ |
| d $y = 30 + 8x + x^2$ | e $y = x^2 + 2x + 1$ | f $y = 8 + 2x - x^2$ |
| g $y = -x^2 + 8x - 7$ | h $y = -x^2 - 4x - 7$ | i $y = x^2 - 5x + 4$ |
| j $y = x^2 + 3x + 3$ | k $y = 3 + 8x + 4x^2$ | l $y = -2x^2 + 8x - 15$ |
| m $y = 1 - x - 2x^2$ | n $y = 25 - 20x + 4x^2$ | o $y = 3x^2 - 4x + 2$ |
- 6 **a** Express $x^2 - 4\sqrt{2}x + 5$ in the form $a(x + b)^2 + c$.
b Write down an equation of the line of symmetry of the curve $y = x^2 + 4\sqrt{2}x + 5$.
- 7 $f(x) \equiv x^2 + 2kx - 3$.
- By completing the square, find the roots of the equation $f(x) = 0$ in terms of the constant k .