# Mark Scheme (Results)

## January 2019

Pearson Edexcel Level 3 Award
In Algebra (AAL30)
Paper 1

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**NOTES ON MARKING PRINCIPLES**

**1      Types of mark**
M marks:  method marks
A marks:  accuracy marks
B marks:  unconditional accuracy marks (independent of M marks)

**2      Abbreviations**

| | |
|---|---|
| cao – correct answer only | ft – follow through |
| isw – ignore subsequent working | SC: special case |
| oe – or equivalent (and appropriate) | dep – dependent |
| indep - independent | |

**3      No working**
If no working is shown then correct answers normally score full marks
If no working is shown then incorrect (even though nearly correct) answers score no marks.

**4      With working**
If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.
If there is no answer on the answer line then check the working for an obvious answer.
Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks.  Discuss each of these situations with your Team Leader.
If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

**5      Follow through marks**

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.

Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

**6      Ignoring subsequent work**

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect cancelling of a fraction that would otherwise be correct

It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

**7      Parts of questions**

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

**8      Use of ranges for answers**

If an answer is within a range this is inclusive, unless otherwise stated.

| Question | | Working | Answer | Mark | Notes |
|---|---|---|---|---|---|
| 1 | (a) | | $(a + c)(b - d)$ | 2 | M1 for $b(a + c)$ and $-d(a + c)$ or $a(b - d)$ and $c(b - d)$ oe<br>A1 for $(a + c)(b - d)$ oe |
| | (b) | | $3r^2t(4 - 3t^2)$ | 2 | B2<br>(B1 for a correct partial factorisation which is a product of 3 or 4 factors) |
| 2 | | | Correct region indicated | 5 | M1 for drawing $y = 2$ and $y = 3x$ correctly<br>M1 for drawing $5x + 3y = 15$ correctly<br>M1 for drawing $2y - x = 1$ correctly<br>A2 for correctly shading required region<br>(A1 for correct shading for 3 inequalities) |
| 3 | | | $x \leqslant -11$ | 3 | M1 for dealing with the fractions,<br>eg $6(x - 3) \geqslant 4(1 + 2x)$<br>or $\frac{12}{4}(x - 3) \geqslant \frac{12}{6}(1 + 2x)$<br>M1 (dep) for isolating terms in $x$, eg $-22 \geqslant 2x$<br>or showing $-11$ as the critical value<br>A1 oe |

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 4 (a) | $a = 1, b = -2, c = -1$<br><br>$\dfrac{--2 \pm \sqrt{(-2)^2 - 4 \times 1 \times -1}}{2 \times 1}$<br><br>$= \dfrac{2 \pm \sqrt{8}}{2}$ | $\dfrac{2 \pm \sqrt{8}}{2}$ | 2 | M1 for correct substitution into formula<br><br>A1 for $\dfrac{2 \pm \sqrt{8}}{2}$ or $1 \pm \sqrt{2}$ |
| (b) | $x^2 + 2x + 4x + 8 = 4x^2 + 2x + 6x + 3$<br>$3x^2 + 2x - 5 = 0$<br>$(3x + 5)(x - 1) = 0$ | $-\dfrac{5}{3}, 1$ | 4 | M1 for a correct expansion, eg $x^2 + 2x + 4x + 8$<br>M1 for expressing equation in the form f($x$) = 0,<br>eg $3x^2 + 2x - 5 = 0$ oe<br>M1 for correct method to solve $3x^2 + 2x - 5 = 0$ oe,<br>eg $(3x + 5)(x - 1)\ (= 0)$<br>A1 for $-\dfrac{5}{3}$, 1 oe (must be in exact form) |
| (c) | | 3 | 1 | B1 cao |

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 5 (a) | | $2p^{-\frac{1}{2}}$ | 2 | B2 for $2p^{-\frac{1}{2}}$ oe <br><br> (B1 for $2p^n$ where $n \neq -\frac{1}{2}$ or $ap^{-\frac{1}{2}}$ oe where $a \neq 2$) |
| (b) | | $u^{\frac{3}{2}}m^{\frac{5}{2}}$ | 2 | M1 for correct first step, eg $\dfrac{u^2}{m^{\frac{1}{2}}} \times \dfrac{m^3}{u^{\frac{1}{2}}}$ <br><br> A1 for $u^{\frac{3}{2}}m^{\frac{5}{2}}$ |
| (c) | | $\dfrac{-7x+3}{(x+3)(x-3)}$ | 3 | M1 for using a correct common denominator <br> A1 for $\dfrac{(x-1)(x-3)-x(x+3)}{(x+3)(x-3)}$ oe <br> A1 for $\dfrac{-7x+3}{(x+3)(x-3)}$ or equivalent simplest form |
| 6 (a) | | $-\dfrac{1}{2}$ | 2 | M1 for rearrangement to isolate $y$ , eg $y = -\frac{1}{2}x + \frac{5}{2}$ <br> A1 for $-\frac{1}{2}$ oe |
| (b) | | 2 | 1 | B1 ft |

| Question | | Working | Answer | Mark | Notes |
|---|---|---|---|---|---|
| 7 | (a) | | $-471$ | 2 | M1 for $a + (n-1)d$ oe ( may be seen with substituted values), eg $24 + 99 \times -5$ or $29 + 100 \times -5$ <br> A1 cao |
| | (b) | | $-94\ 700$ | 2 | M1 for substitution into $\frac{1}{2}n(2a + (n-1)d)$ <br> or $\frac{1}{2}n(a + l)$ <br> eg $\frac{1}{2} \times 200(2 \times 24 + (200 - 1) \times -5)$ <br> or $\frac{1}{2} \times 200(24 + -971)$ <br> A1 cao |
| 8 | (a) | | 25 | 2 | M1 for $(2\sqrt{5})^2 + (-\sqrt{5})^2$ or $(2\sqrt{5})^2 = 20$ or $\left(-\sqrt{5}\right)^2 = 5$ <br> A1 cao |
| | (b) | | $-4 + 4\sqrt{5}$ | 2 | M1 for expanding $(2\sqrt{5} + 2)(-\sqrt{5} + 3)$ to obtain 4 terms with all 4 correct without considering signs or for 3 terms out of 4 correct with correct signs <br> A1 for $-4 + 4\sqrt{5}$ |
| | (c) | | $\frac{1}{3}$ | 2 | M1 for simplifying to $\sqrt{5} \div 3\sqrt{5}$ oe <br> or rationalising to $\frac{20-10-10+5}{20-5}$ oe <br> A1 for $\frac{1}{3}$ oe |

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 9 (a) | | 1.2 | 2 | M1 for substitution, eg $\sqrt{\frac{61}{25}-1}$ oe <br> A1 for 1.2 oe |
| (b) | | $c = \frac{b}{m^2+1}$ | 4 | M1 for correct first step, eg $m^2 = \frac{b}{c} - 1$ <br> M1 (dep M1) for correct second step, eg $cm^2 = b - c$ <br> M1 (dep M2) for isolating terms in $c$, eg $cm^2 + c = b$ <br> A1 cao |
| 10 (a) | | $4x - 5y - 13 = 0$ | 3 | M1 for correct use of gradient, eg $y = \frac{4}{5}x + c$ <br> M1 for a correct equation in any form, <br> eg $y - -1 = \frac{4}{5}(x-2)$ or $y = \frac{4}{5}x - \frac{13}{5}$ <br> A1 for $4x - 5y - 13 = 0$ oe with integer coefficients |
| (b) | | $y = \frac{4}{5}x + \frac{8}{5}$ | 3 | M1 for gradient of $\mathbf{L_2} = \frac{4}{5}$ ft from (a) <br> M1 for a complete method to find equation <br> A1 for $y = \frac{4}{5}x + \frac{8}{5}$ oe |
| (c) | | statement with supportive working | 2 | M1 for at least one correct gradient , $-\frac{3}{2}$ or $\frac{2}{3}$ <br> A1 for line is perpendicular with reason, <br> eg $-\frac{3}{2} \times \frac{2}{3} = -1$ oe |

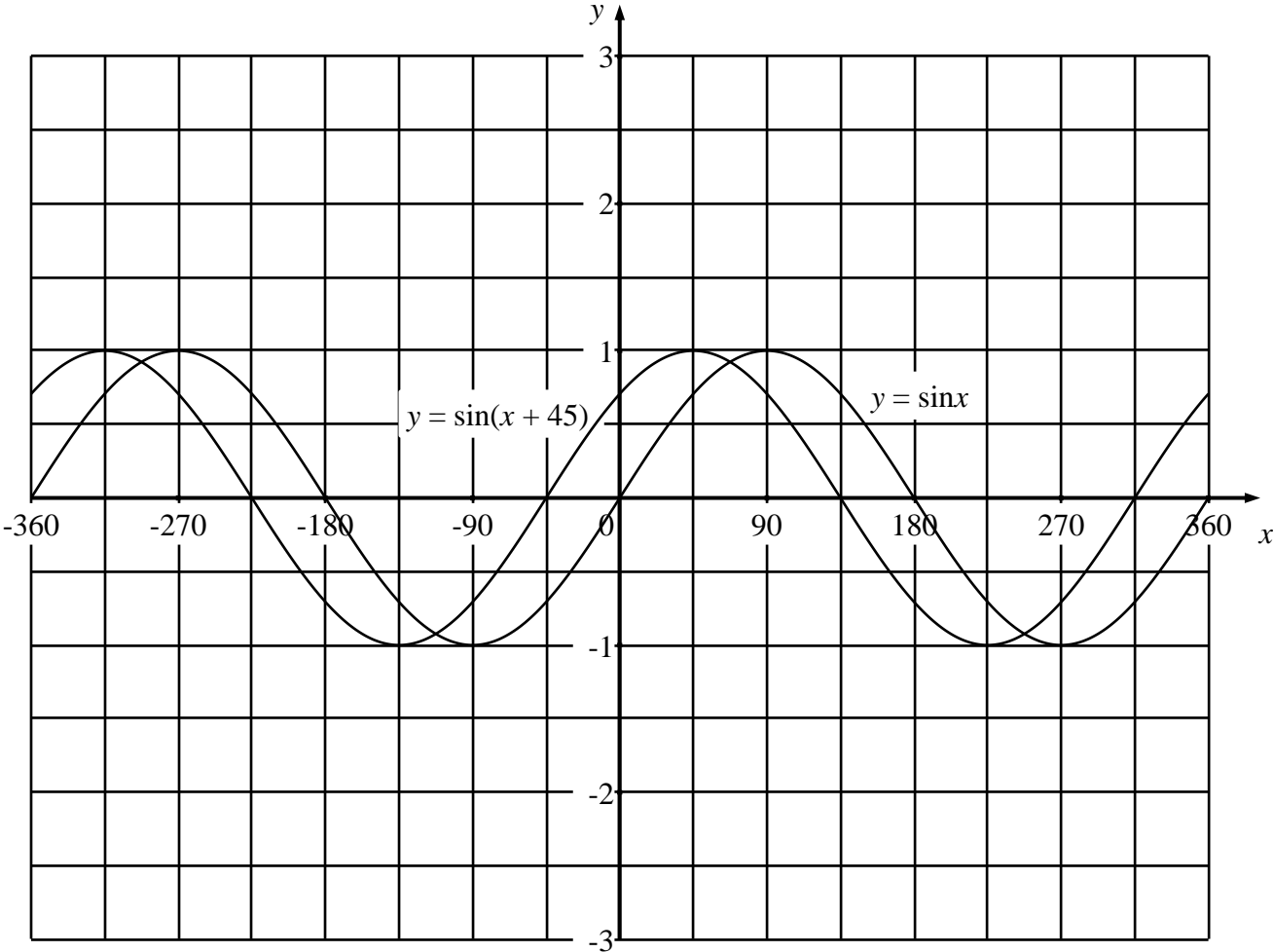| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 11 (a) | $2 = \dfrac{k}{\sqrt{25}}$ | $T = \dfrac{10}{\sqrt{f}}$ | 3 | M1 $T \propto \dfrac{1}{\sqrt{f}}$ or $T = \dfrac{k}{\sqrt{f}}$ oe, may be implied by substitution <br> M1 for substitution to find $k$ <br> A1 cao |
| (b) | | $\dfrac{1}{2}$ | 2 | M1 for substitution of $f = 400$ in $T = \dfrac{k}{\sqrt{f}}$ <br> A1 for $\dfrac{1}{2}$ or 0.5 |
| 12 (a) | $\frac{1}{2} \times 0.2\{(0 + 5) + 2( 5.6 + $ <br> $8.8 + 10 + 8.8)\}$ | 7.14 | 3 | M1 for using values, eg $(y_0 =)$ 0, $(y_1 =)$ 5.4 to 5.6, $(y_2 =)$ 8.8, $(y_3 =)$ 10, $(y_4 =)$ 8.8, $(y_5 =)$ 4.8 to 5.2 (condone 1 error) <br> M1(dep) for substituting "values" and eg $h = 0.2$ into trapezium rule, <br> eg $\frac{1}{2} \times 0.2\{(0 + 5) + 2( 5.6 + 8.8 + 10 + 8.8)\}$ <br> A1 for 7.08 to 7.16 oe |
| (b) | | distance travelled | 1 | B1 for distance (travelled by the point between $t = 0$ and $t = 1.0$) |
| (c) | | 0.6 | 1 | B1 cao |
| 13 (a) | | $-3, -1, 4$ | 2 | B2 for all 3 correct values <br> (B1 for 2 correct values) |
| (b) | | 4.45 to 4.55 | 2 | M1 for correct use of cubic graph, eg line from 10 on $y$-axis across to graph or $0.5x^3 - 6.5x - 6 = 10$ <br> A1 for 4.45 to 4.55 |

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 14 | $x^2 + 3x + 2 = x + 2$<br>$x^2 + 2x = 0$<br>$x(x + 2) = 0$<br>$x = 0, x = -2$<br>$y = 2, y = 0$ | 0, 2 and $-2$, 0 | 4 | M1 for substitution of $y = x + 2$ into the quadratic equation oe to obtain equation in one variable<br>M1 for $x^2 + 2x \, (= 0)$ oe<br>A1 $x = 0, -2$ or $y = 2, 0$<br>A1 for $x = 0, \; y = 2$ and $x = -2, \; y = 0$ |
| 15 (a) | Translation by $\begin{pmatrix} -45 \\ 0 \end{pmatrix}$ | Sketch graph | 2 | M1 for translation parallel to $x$-axis<br>A1 for correct curve sketched in interval $-360 \leqslant x \leqslant 360$ |
| (b) | Translation by $\begin{pmatrix} 0 \\ -2 \end{pmatrix}$ | Sketch graph | 2 | M1 for translation parallel to $y$-axis<br>A1 for correct curve sketched in interval $-360 \leqslant x \leqslant 360$ |
| 16 (a) | | $x \leq -1, x \geq 5$ | 3 | M1 for writing in form $x^2 - 4x - 5 \; (\geq 0)$<br>or $-x^2 + 4x + 5 \; (\leq 0)$<br>M1 for establishing critical values, 5 and $-1$<br>A1 cao |
| (b) | | $-40 < b < 40$ | 2 | M1 for use of $b^2 - 4ac < 0$ or $b^2 < 4ac$ or $b < 40$<br>or $-40 < b$<br>A1 for $-40 < b < 40$ |

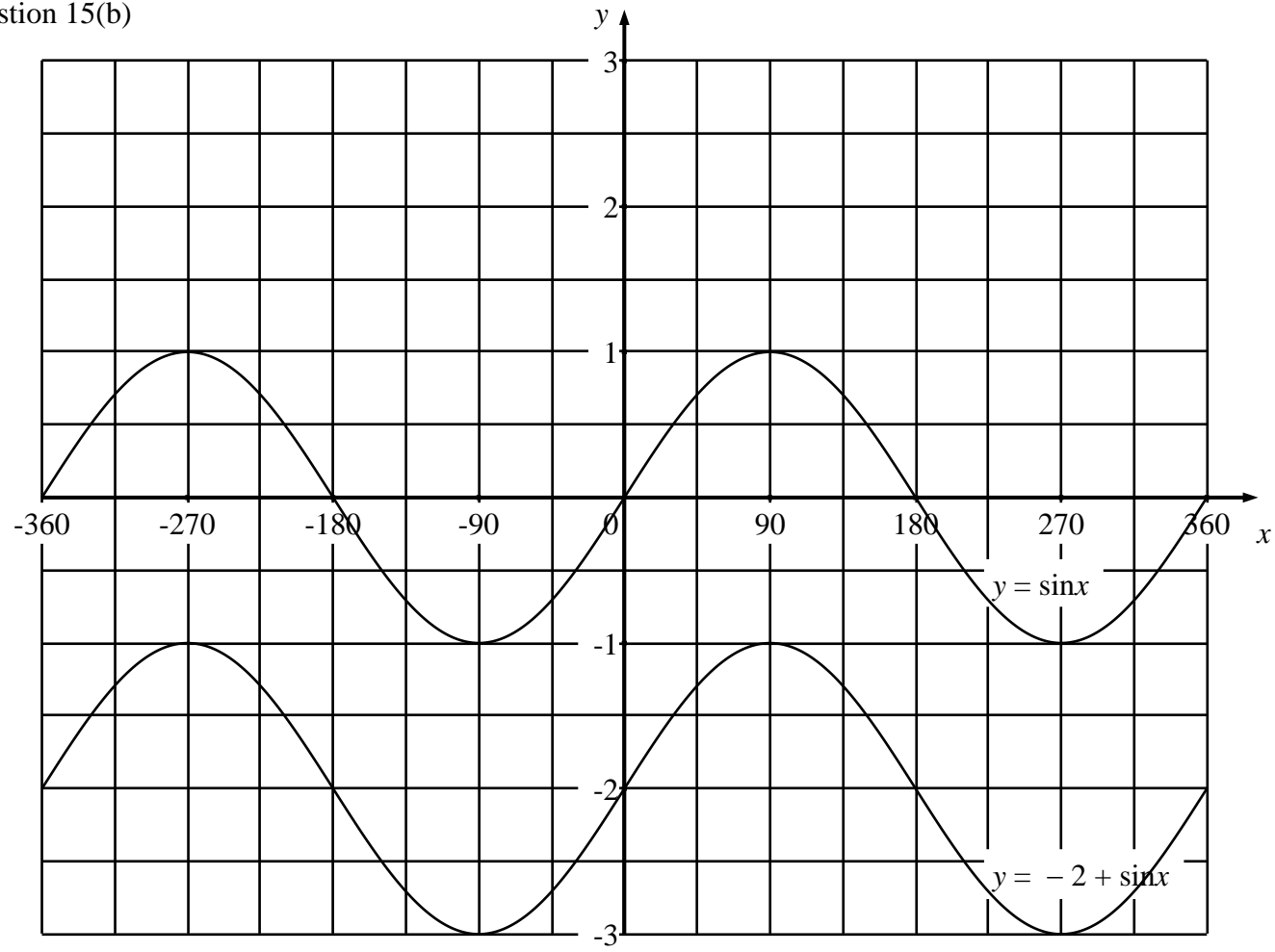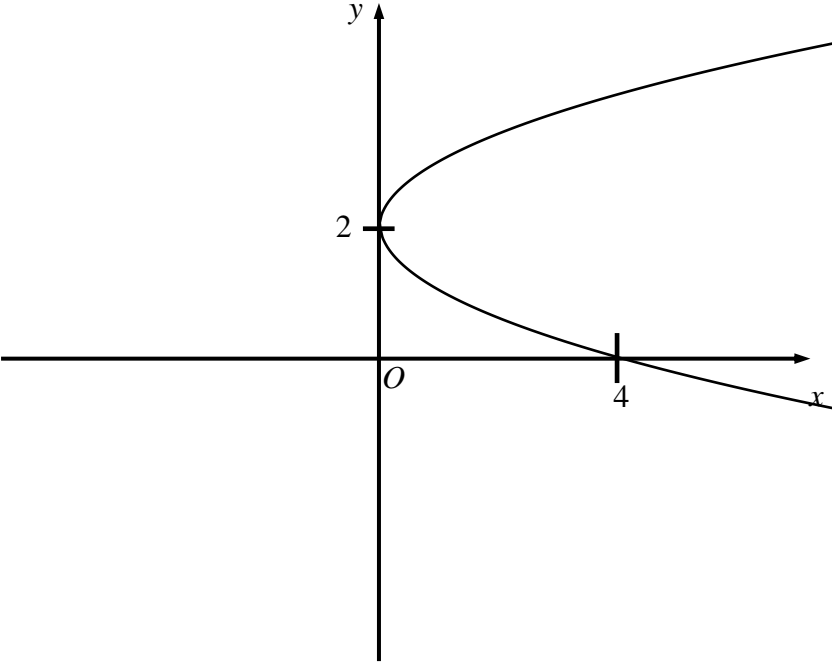| Question | | Working | Answer | Mark | Notes |
|---|---|---|---|---|---|
| 17 | (a) | | $(2x - 7)^2 - 49$ | 2 | B1 $a = 7$<br>B1 $b = 49$ |
| | (b) | | $(3.5, -49)$ | 1 | B1 ft completed square in (a) |
| 18 | (a) | | Graph sketch | 3 | M1 for parabola with symmetry about a line $y = a$<br>M1 for a single $y$ intercept labelled at 2 or<br>for a single $x$ intercept labelled at 4<br>A1 fully correct graph drawn with all labels |
| | (b) | | Graph sketch | 4 | B1 for asymptote of $x = -5$<br>B1 for $y$ intercept at $(0, \dfrac{1}{5})$<br>M1 for correct shape<br>A1 for fully correct graph |

Question 2



$y = 3x$

$2y - x = 1$

$y = 2$

R

$5x + 3y = 15$
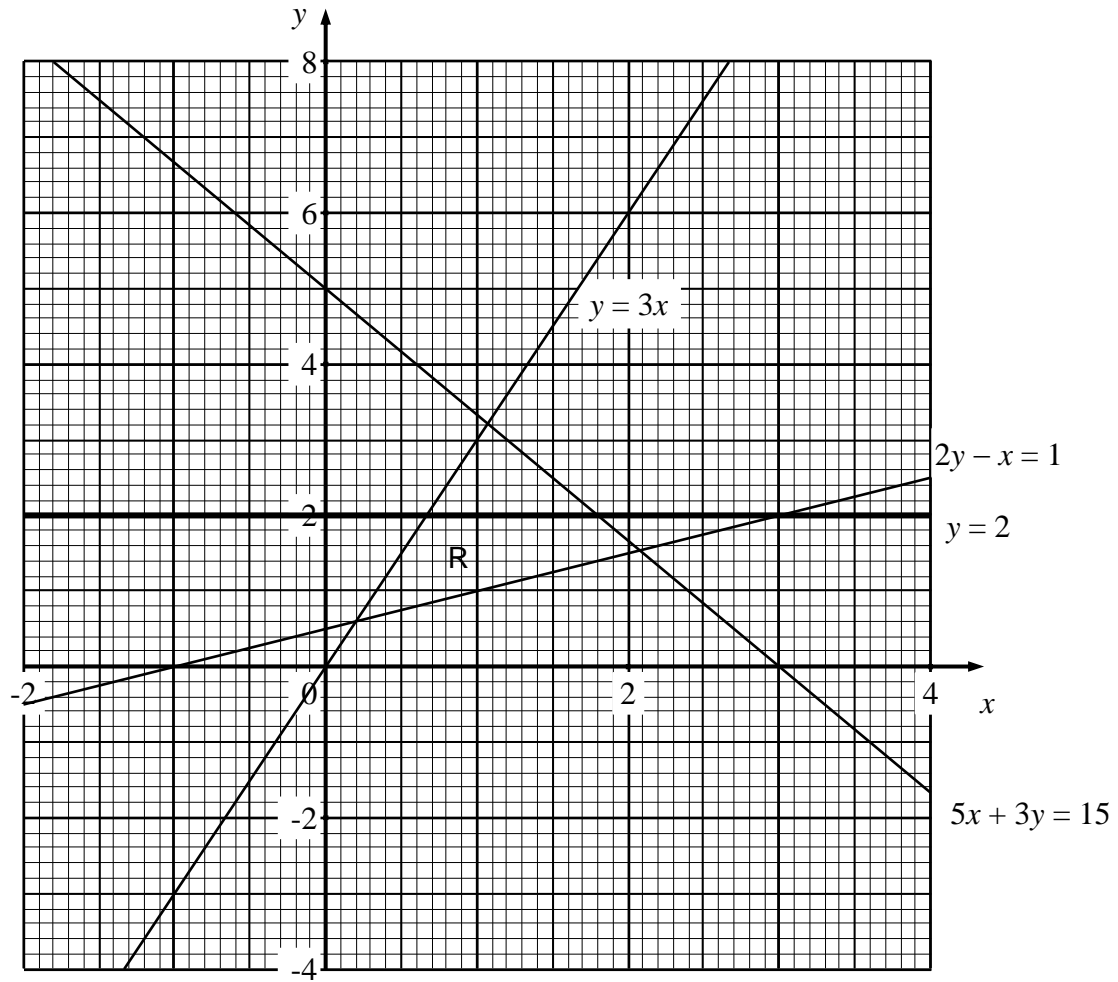
Question 15(a)

Question 15(b)



$y = \sin x$

$y = -2 + \sin x$

Question 18(a)

Question 18(b)