# Mark Scheme (Results)

## January 2018

**Edexcel and BTEC Qualifications**

Edexcel and BTEC qualifications are awarded by Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk. Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

**Pearson: helping people progress, everywhere**

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

## 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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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) | $5c(4d^2 - 3cd)$ or $cd(20d - 15c)$ or $5d(4cd - 3c^2)$ | $5cd(4d - 3c)$ | 2 | B2 <br> (B1 for a partial correct factorisation which shows a product of 3 factors) |
| | (b) | | $(5k - 1)(k + 4)$ | 2 | M1 for $(5k \pm 1)(k \pm 4)$ <br> A1 |
| 2 | | | Correct region indicated | 4 | M1 for drawing $y = 3x - 6$ <br> M1 for drawing $2x + y = 12$ <br> A2 for correctly indicating required region <br> (A1 for correctly indicating region satisfying 3 of the inequalities) |
| 3 | | | $x > \dfrac{7}{23}$ | 3 | M1 for correct expansion of both brackets or expansion of $\frac{6}{5}(2 - 3x)$ or $\frac{5}{6}(x + 1)$ <br> M1 (dep M1) for isolating terms in $x$, eg $7 < 23x$ <br> A1 oe |
| 4 | | $a = 5, b = 2, c = -1$ <br><br> $\dfrac{-2 \pm \sqrt{2^2 - 4 \times 5 \times -1}}{2 \times 5}$ <br><br> $= \dfrac{-2 \pm \sqrt{24}}{10} = \dfrac{-1 \pm \sqrt{6}}{5}$ | $\dfrac{-1 \pm \sqrt{6}}{5}$ | 3 | M1 for correct substitution into formula <br> M1 for simplifying to $\frac{-2 \pm \sqrt{24}}{10}$ or $\frac{-2 \pm \sqrt{4}\sqrt{6}}{10}$ or $\frac{-1 \pm \sqrt{1+5}}{5}$ <br> A1 cao |

| Question | | Working | Answer | Mark | Notes |
|---|---|---|---|---|---|
| 5 | (i) | | $(x - 7)(x + 7)$ | 4 | B1 |
| | (ii) | | $\dfrac{x - 7}{x}$ | | M1 for complete factorisation or multiplying and inverting second fraction<br>M1 for complete factorisation **AND** multiplying and inverting second fraction<br>A1 for $\dfrac{x - 7}{x}$ or $1 - \dfrac{7}{x}$ |
| 6 | (a) | A circle, centre (0, 0), radius 8 | Circle drawn | 2 | M1 for drawing a circle, centre (0, 0) or a circle, radius 8<br>A1 cao |
| | (b) | | $y = \pm\sqrt{(64 - x^2)}$ | 2 | M1 for $y^2 = 64 - x^2$ or $y = \sqrt{(64 - x^2)}$<br>A1 oe |

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 7 | | $4\sqrt{10}$ | 3 | M1 for a correct expansion<br>eg $\sqrt{125}\times\sqrt{8}-\sqrt{5}\times\sqrt{8}-\sqrt{125}\times\sqrt{2}+\sqrt{5}\times\sqrt{2}$ or<br>$\sqrt{1000}-\sqrt{40}-\sqrt{250}+\sqrt{10}$ allow one sign error<br>M1 for simplifying one term correctly to the form $a\sqrt{10}$ or $a\sqrt{5}\ \sqrt{2}$ where $a\neq 1$<br>A1 for $4\sqrt{10}$ (accept $2\sqrt{40}$)<br>OR<br>M1 for $\sqrt{125}=5\sqrt{5}$ or $\sqrt{8}=2\sqrt{2}$<br>M1 for $4\sqrt{5}\times\sqrt{2}$<br>A1 for $4\sqrt{10}$ (accept $2\sqrt{40}$) |
| 8 (a) | | $x^2$ | 1 | B1 cao |
| (b) | | $64y^2$ | 2 | M1 for $4^3(=64)$ or $y^3\times\frac{2}{3}\ (=y^2)$<br>A1 cao |
| (c) | | $a=3,\ b=-2,\ n=4$ | 2 | B2 for all 3 correct values<br>(B1 for 2 correct values) |
| (d) | | $24y$ | 2 | M1 for one correct expansion or use of difference of 2 squares<br>A1 cao |

| Question | | Working | Answer | Mark | Notes |
|---|---|---|---|---|---|
| 9 | (a) | | $7x + 4y = 34$ | 3 | M1 for method to find gradient of $\mathbf{L_1}$, eg $\frac{-2-5}{6-2}\left(=-\frac{7}{4}\right)$<br><br>M1 for a correct equation in any form,<br>eg $y - 5 = -\frac{7}{4}(x - 2)$<br><br>A1 for $7x + 4y = 34$ oe with integer coefficients in the form $ax + by = c$ |
| | (b) | | $y = \dfrac{4}{7}x + 1$ | 3 | M1 for method to find gradient of $\mathbf{L_2}$<br>M1 (dep M1) for a method to find the equation in any form eg $5 = \frac{4}{7} \times 7 + c$ or $\frac{y-5}{x-7} = \frac{4}{7}$<br><br>A1 ft from (a) for $y = \frac{4}{7}x + 1$ |
| | (c) | | No with reason | 1 | M1 for No, with reason, eg $3 \times \frac{1}{3} \neq -1$ |
| 10 | (a) | $-3, -2, -1, \ 0, \ 1, 2, \ 3$<br>$-20, -7, -4, -5, -4, \ 5, \ 28$ | Curve drawn | 4 | B2 for all values correct<br>(B1 for 4, 5 or 6 correct values)<br>M1 (dep B1) for all their points correctly plotted<br>A1 for correct curve |
| | (b) | | 1.6 | 2 | M1 for intercept of $x$ axis indicated (provided a cubic is drawn) or $x^3 + x^2 - x - 5 = 0$<br>A1 for $1.5 - 1.7$ or ft their cubic graph |

| Question | | Working | Answer | Mark | Notes |
|---|---|---|---|---|---|
| 11 | (a) | $10 = 0.25k$ | $m = 40h^2$ | 3 | M1 $m \propto h^2$ or $m = kh^2$ oe, may be implied by substitution <br> M1 (dep M1) for substitution to find $k$ <br> A1 cao |
| | (b) | $160 = 40h^2$ | $\pm 2$ | 2 | M1 for substitution of $m = 160$ in $m = "kh^2"$ (may be implied by one correct value) <br> A1 cao |
| 12 | (a) | | $\dfrac{1}{3}$, 1, 3, 9, 27 | 2 | B2 all correct <br> (B1 for 3 or 4 correct) |
| | (b) | $\dfrac{1}{2} \times 1 \left\{ \left( \dfrac{1}{3} + 27 \right) + 2(1+3+9) \right\}$ | $26\dfrac{2}{3}$ | 3 | M1 ft for using values $(y_0 =) \dfrac{1}{3}$, $(y_1 =) 1$, $(y_2 =) 3$, $(y_3 =) 9$, $(y_4 =) 27$ <br> M1(dep) for substituting values and $h = 1$ into trapezium rule, <br> eg $\dfrac{1}{2} \times 1 \left\{ \left( \dfrac{1}{3} + 27 \right) + 2(1+3+9) \right\}$ oe <br> A1 for $26\dfrac{2}{3}$ oe (accept 26.6….) |
| 13 | | | Graph sketch | 3 | M1 for parabola with symmetry about a line $y = a$ <br> M1 (dep M1) for −1 labelled as $x$ intercept <br> A1 fully correct graph drawn with all labels |

| Question | | Working | Answer | Mark | Notes |
|---|---|---|---|---|---|
| 14 | (a) | $202.5 - 51 \times 2.5$ | 75 | 2 | M1 for substitution of $a = 200$, $d = -2.5$, $n = 51$ into $a + (n-1)d$ oe <br> A1 cao |
| | (b) | $\dfrac{80}{2}(2a + (80 - 1) \times 10) = 40000$ <br> $40(2a + 790) = 40000$ <br> $2a + 790 = 1000$ <br> $a = 105$ | 105 | 3 | M1 for $S = \dfrac{n}{2}\{2a + (n-1)d\}$, may be implied by substitution <br> M1 for method to isolate terms in $a$ in $\dfrac{80}{2}(2a + (80 - 1) \times 10) = 40000$ <br> A1 cao |
| 15 | (a) | $2(3x + 1)(x - 4)$ | $-\dfrac{1}{3}, 4$ | 2 | M1 for correct factorisation or correct substitution into formula <br> A1 for $-\dfrac{1}{3}, 4$ oe |
| | (b) | | $-\dfrac{5}{2}, -\dfrac{43}{4}$ | 3 | M1 for method to find value of $p$ <br> A1 for $p = -\dfrac{5}{2}$ oe <br><br> A1 for $q = -\dfrac{43}{4}$ oe |
| | (c) | | $\dfrac{8}{3}$ | 1 | B1 for $\dfrac{8}{3}$ oe |

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 16 (a) | | 127.5 | 3 | M1 for stating area under the graph represents the distance travelled or calculate one area<br>M1 for complete method to calculate total area<br>A1 oe |
| (b) | | 3.75 | 2 | M1 for a method to find gradient<br>A1 oe |
| 17 | $32x^2 - 9(\frac{4}{3}x)^2 = 1$<br>$32x^2 - 16x^2 = 1$<br>$16x^2 = 1$<br>OR<br>$32\left(\frac{3y}{4}\right)^2 - 9y^2 = 1$<br>$18y^2 - 9y^2 = 1$<br>$9y^2 = 1$ | $\frac{1}{4}, \frac{1}{3}$ and $-\frac{1}{4}, -\frac{1}{3}$ | 4 | M1 for substitution of $y = \frac{4}{3}x$ or $x = \frac{3}{4}y$ or $9y^2 = (4x)^2$ into the quadratic equation oe to obtain equation in one variable<br>M1 for method to simplify to $32x^2 - 16x^2 = 1$ or $18y^2 - 9y^2 = 1$<br>A1 $x = \pm\frac{1}{4}$ oe or $y = \pm\frac{1}{3}$ oe or $x = \frac{1}{4}$, $y = \frac{1}{3}$ or $x = -\frac{1}{4}$, $y = -\frac{1}{3}$<br>A1 for $x = \frac{1}{4}$, $y = \frac{1}{3}$ and $x = -\frac{1}{4}$, $y = -\frac{1}{3}$ |
| 18 (a) | Reflection in $x$-axis | Correct graph | 2 | M1 for reflection in $x$-axis<br>A1 for curve drawn with $(-4, 0)$, $(0, 0)$ and $(-2, 3)$ labelled |
| (b) | Stretch in direction of $y$-axis factor $\frac{1}{2}$ | Correct graph | 2 | M1 for stretch in direction of $y$-axis<br>A1 for curve drawn with $(-4, 0)$, $(0, 0)$ and $(-2, -\frac{3}{2})$ labelled |

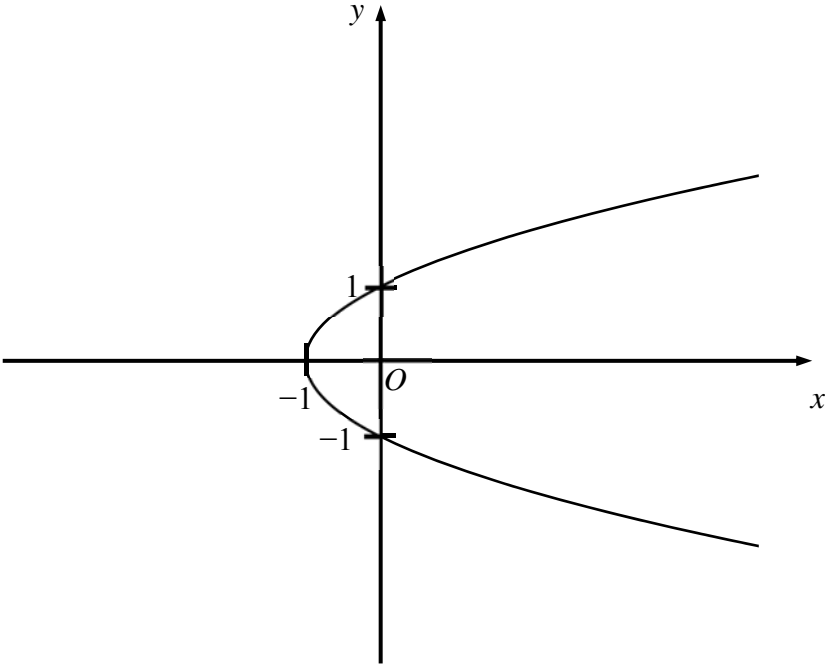| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 19 | | Sketch | 2 | M1 for correct graph shape<br>A1 fully correct and labelled intersection at (0, 1) |
| 20 (a) | | Shown | 3 | M1 for stating $b^2 - 4ac$ $(> 0)$ or $b^2 > 4ac$ (may be implied by substitution)<br>M1 for $(p - 6)^2 - 4 \times p \times 2 > 0$ or $(p - 6)^2 > 4 \times p \times 2$<br>A1 result from correct working |
| (b) | | $p < 2$,<br>$p > 18$ | 3 | M1 for correct method to find critical values, eg factorising to $(p-2)(p-18)$<br>A1 for establishing critical values of 2 and 18<br>A1 for $p < 2$, $p > 18$ |

Question 2
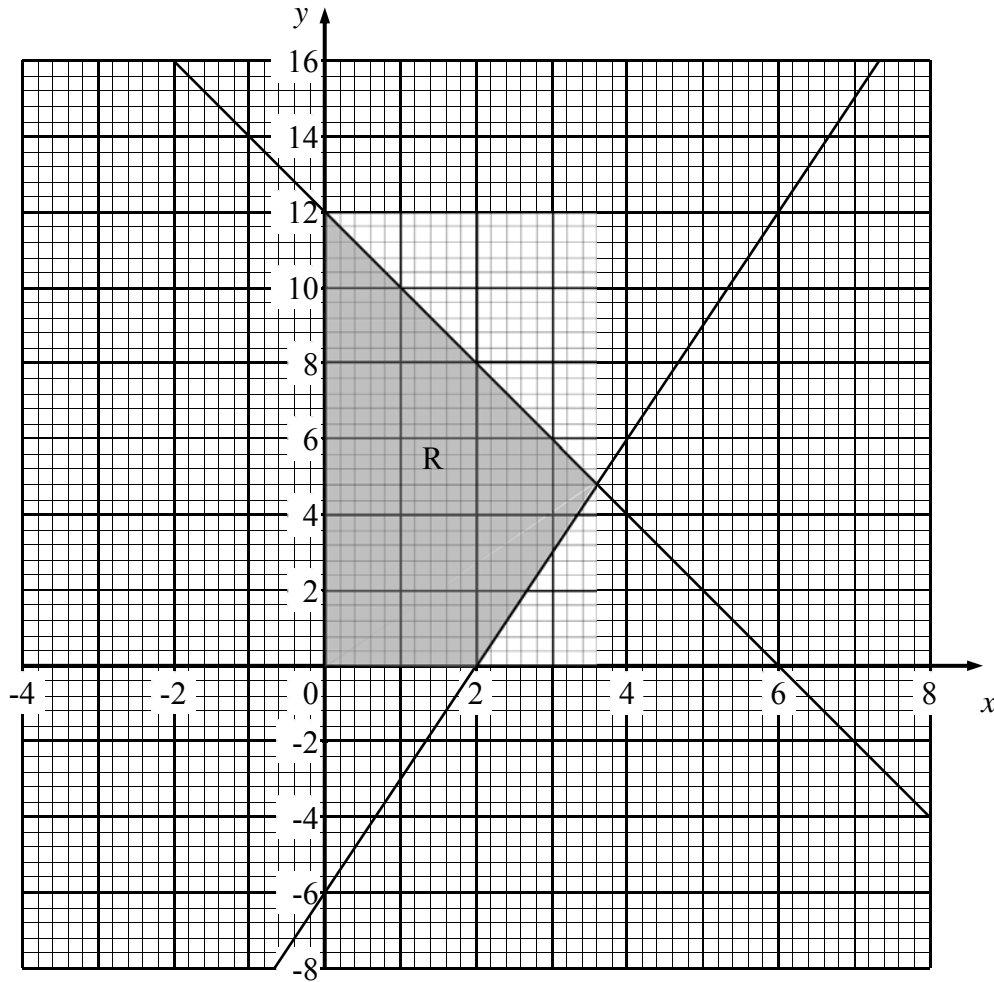


Please ensure the whole of the area bounded by the 4 lines $x = 0$, $y = 0$, $y = 3x - 6$ and $2x + y = 12$ is shaded
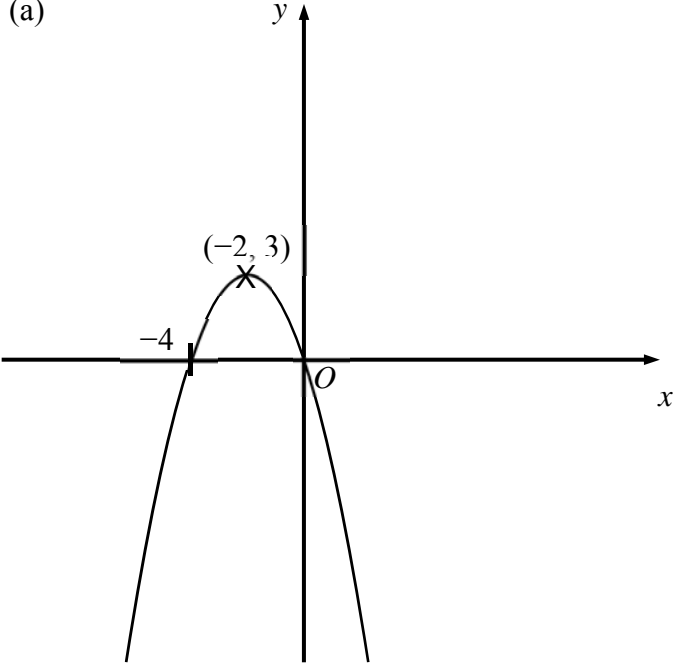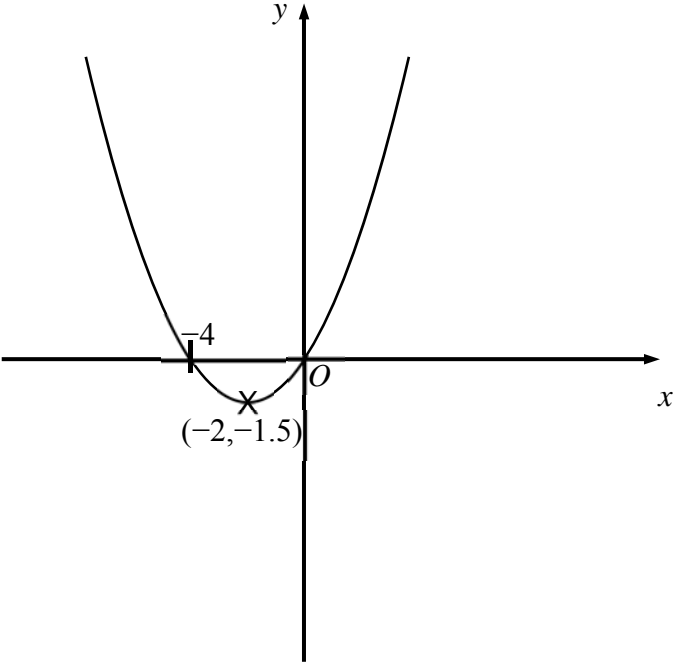
Question 10
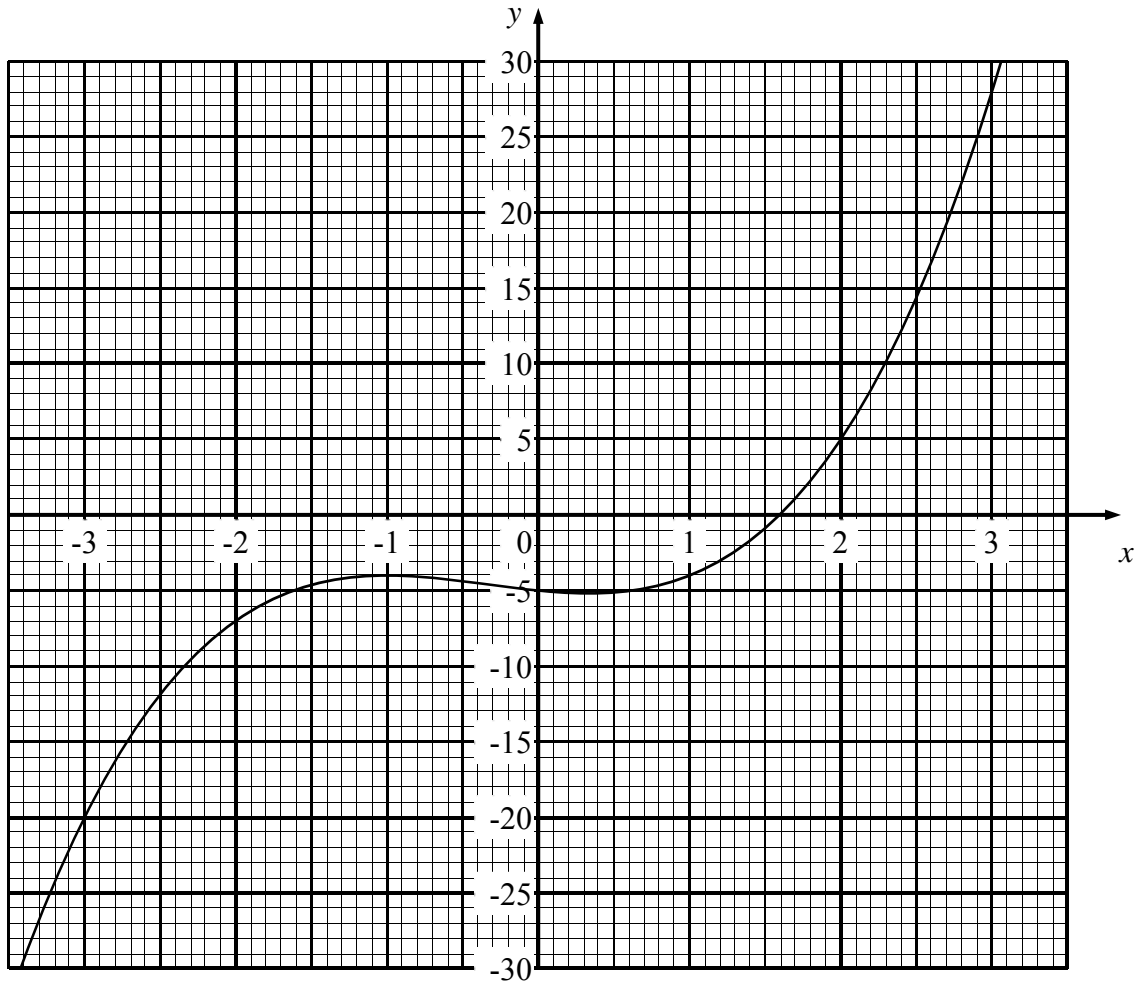
Question 13

Question 18

(a)



(b)

Question19