GCSE HIGHER TO AS MATHS

Transitional Questions

Information

The questions in this booklet are from the HIGHER GCSE syllabus
They are all questions that are contained in the AS/A2 Maths scheme of work.

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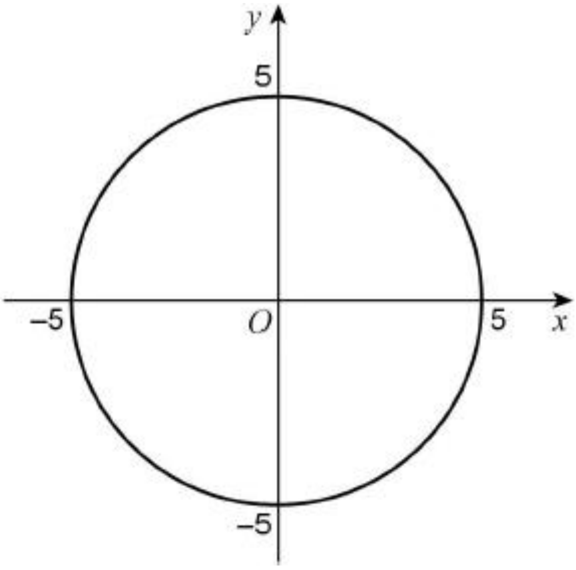
Q1.

A circle, centre O, passes through (5, 0).



What is the equation of the circle?

Circle your answer.

$x^2 + y^2 = 25$ $\quad$ $x^2 + y^2 = 5$ $\quad$ $x^2 + y^2 = 10$ $\quad$ $x^2 + y^2 = 100$

(Total 1 mark)

Q2.

$$w = \frac{3}{5\sqrt{x}}$$

Circle the expression for w^2

$\frac{6}{10x^2}$ $\quad$ $\frac{9}{25x^2}$ $\quad$ $\frac{6}{10x}$ $\quad$ $\frac{9}{25x}$

(Total 1 mark)

Q3.

The equation of a curve is $y = (x + 3)^2 + 5$

Circle the coordinates of the turning point.

(5, 3) $\quad$ (5, −3) $\quad$ (3, 5) $\quad$ (−3, 5)

(Total 1 mark)

Q4.

Expand and simplify $(2x + 5)(2x - 5)(3x + 7)$

Answer ______________________

(Total 3 mark)

Q5.

(a) Factorise fully $9y^3 - 6y$

Answer ______________________

(2)

(b) Factorise $3x^2 - 22x + 7$

Answer ______________________

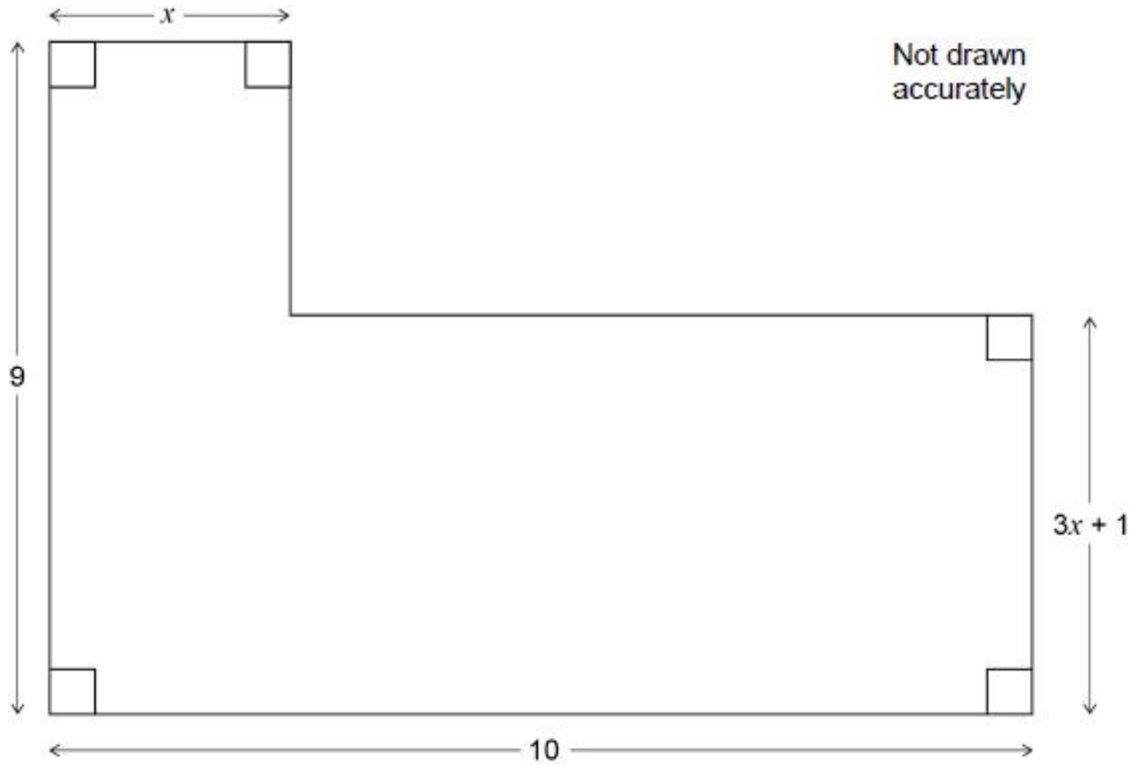
(2)

(Total 4 marks)

Q6.

Here is an L-shape.

All dimensions are in centimetres.



The area of the L-shape is 65 cm^2

Work out the value of x.

Answer ______________________

(Total 6 marks)

Q7.

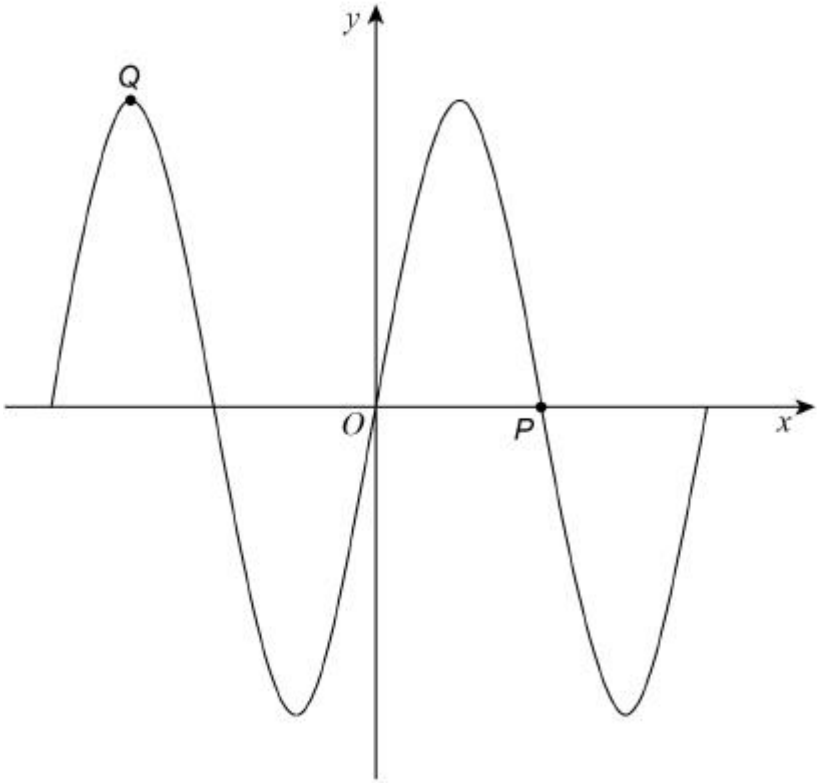
Expand and simplify $(x - 4)(2x + 3y)^2$

Answer ______________________________

(Total 4 marks)

Q8.

Here is a sketch of $y = \sin x°$ for $-360 \le x \le 360$



(a) Write down the coordinates of *P*.

Answer (__________ , __________)

(1)

(b) Write down the coordinates of *Q*.

Answer (__________ , __________)

(1)

(Total 2 marks)

Q9.

The line $y = 3x + p$ and the circle $x^2 + y^2 = 53$ intersect at points A and B.

p is a positive integer.

(a) Show that the x-coordinates of points A and B satisfy the equation

$$10x^2 + 6px + p^2 - 53 = 0$$

(3)

(b) The coordinates of A are (2, 7)

Work out the coordinates of B.

You **must** show your working.

Answer (______________ , ______________)

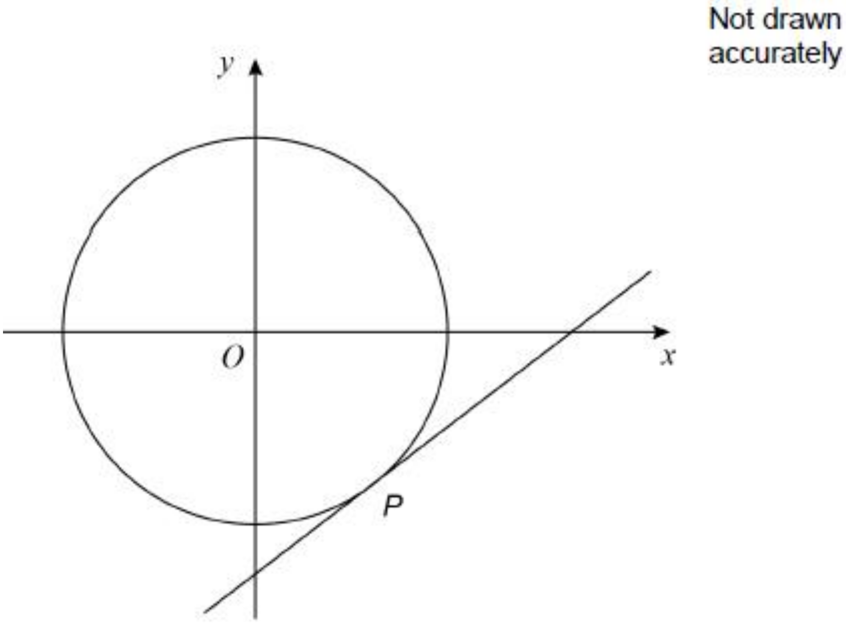
(5)

(Total 8 marks)

Q10.

P is a point on the circle with equation $x^2 + y^2 = 80$

P has *x*-coordinate 4 and is below the *x*-axis.



Work out the equation of the tangent to the circle at *P*.

Answer ______________________________

(Total 5 marks)

Q11.

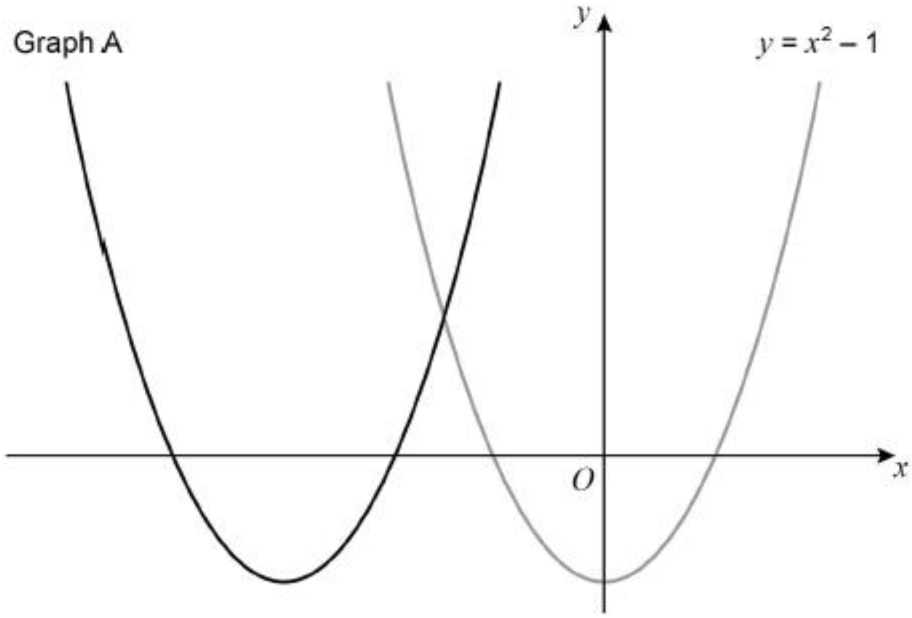
Simplify fully $\dfrac{x^5 - 4x^3}{3x - 6}$

Answer ______________________________

(Total 3 marks)

Q12.

Here are sketches of two graphs.



The graph of $y = x^2 - 1$ is translated 3 units to the left to give graph A.

(a) The equation of graph A can be written in the form $y = x^2 + bx + c$

Work out the values of b and c.

b = ______________________

c = ______________________

(3)

(b) The graph of $y = x^2 - 1$ is reflected in the x-axis to give graph B.

Work out the equation of graph B.

Answer ______________________

(1)

(Total 4 marks)

Q13.

A curve has equation $y = 4x^2 + 5x + 3$

A line has equation $y = x + 2$

Show that the curve and the line have **exactly** one point of intersection.

Do **not** use a graphical method.

(Total 4 marks)

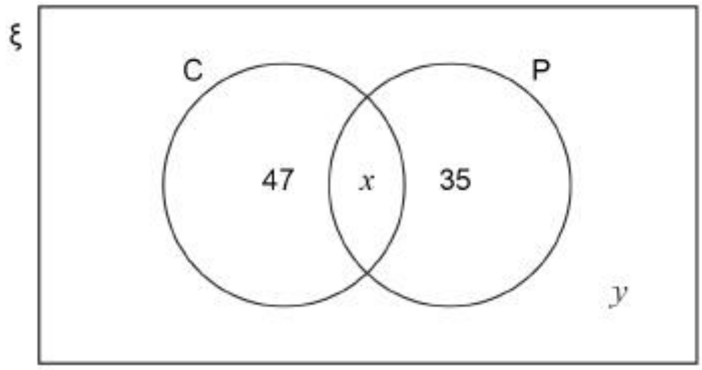
Q14.

The Venn diagram shows some information about 150 students.

ξ = 150 students

C = students who study Chemistry

P = students who study Physics



The probability that a Physics student, chosen at random, also studies Chemistry is $\frac{5}{12}$

One of the 150 students is chosen at random.

Work out the probability that the student does **not** study either Chemistry or Physics.

Answer ______________________

(Total 4 marks)

Q15.

Solve $\dfrac{x}{x+4} + \dfrac{7}{x-2} = 1$

You **must** show your working.

$x =$ ______________________

(Total 4 marks)

Q16.

(a) Jo wants to work out the solutions of $x^2 + 3x - 5 = 0$

She says,

"The solutions **cannot** be worked out because

$x^2 + 3x - 5$ does **not** factorise to $(x + a)(x + b)$ where a and b are integers."

Is Jo correct?

Tick a box.

☐ Yes ☐ No

Give a reason for your answer.

(1)

(b) **Without** expanding any brackets,

show how to work out the **exact** solutions of $9(x + 3)^2 = 4$

Give the solutions.

(3)

(Total 4 marks)

Q17.

n is a positive integer.

Prove algebraically that $2n^2\left(\frac{3}{n}+n\right)+6n\left(n^2-1\right)$ is a cube number.

____

____

____

____

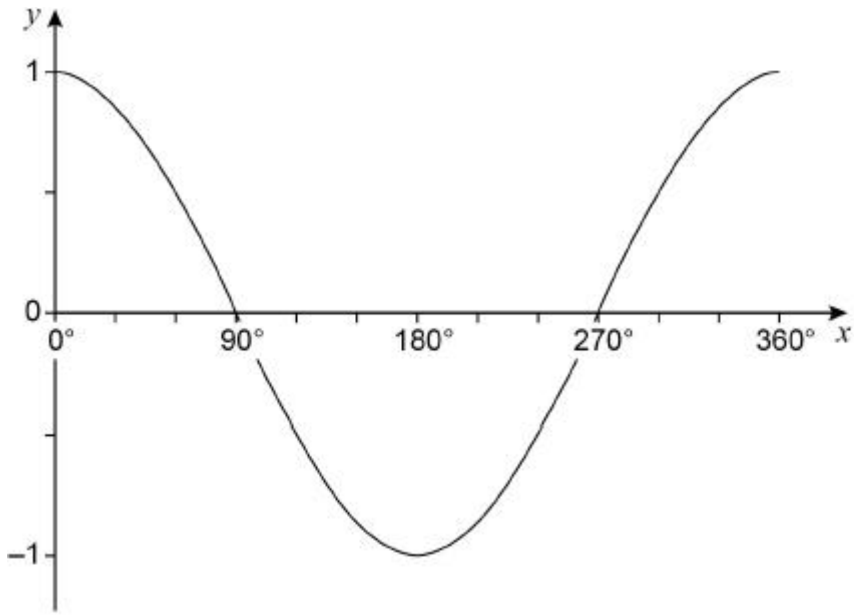
____

____

(Total 3 marks)

Q18.

Here is a sketch of the graph of $y = \cos x$ for values of x from 0° to 360°



(a) cos x = cos 60°

Work out the value of x when 90° ≤ x ≤ 360°

Answer ______________________________ degrees

(1)

(b) cos x = − cos 60°

Work out the value of x when 180° ≤ x ≤ 360°

Answer ______________________________ degrees

(1)

(Total 2 marks)

Q19.

$$f(x) = \frac{2x+3}{x-4}$$

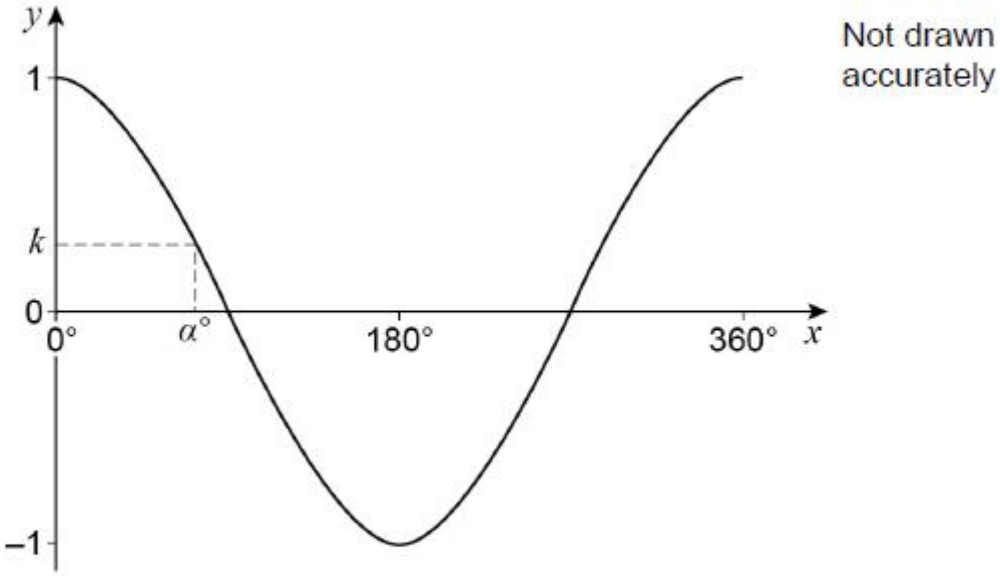
Work out $f^{-1}(x)$

Answer ______________________________

(Total 4 marks)

Q20.

Here is a sketch of $y = \cos x$ for values of x from 0° to 360°



$\alpha°$ is an acute angle.

$\cos \alpha° = k$

(a) Circle the value of $\cos(180° - \alpha°)$

$1 - k$ k $-k$ $-1 - k$

(1)

(b) Circle the value of $\cos(360° + \alpha°)$

$k - 1$ $k + 1$ $-k$ k

(1)

(Total 2 marks)

Q21.

f(x) $\frac{x}{x+2}$ g(x) = $x^2 - 2$

Work out fg(x)

Give your answer in the form $a + bx^n$ where a, b and n are integers.

Answer ______________________

(Total 3 marks)

Q22.

An approximate solution to an equation is found using the iterative formula

$x_{n+1} = \frac{(x_n)^3 - 2}{10}$ with $x_1 = -1$

(a) Work out the values of x_2 and x_3

x_2 = ______________________

x_3 = ______________________

(2)

(b) Work out the solution to 5 decimal places.

x = ______________________

(1)

(Total 3 marks)

Q23.

The point $\left(3, \frac{1}{64}\right)$ lies on the curve $y = k^x$ where k is a constant.

Show that the point $\left(\frac{1}{2}, \frac{1}{2}\right)$ lies on the curve.

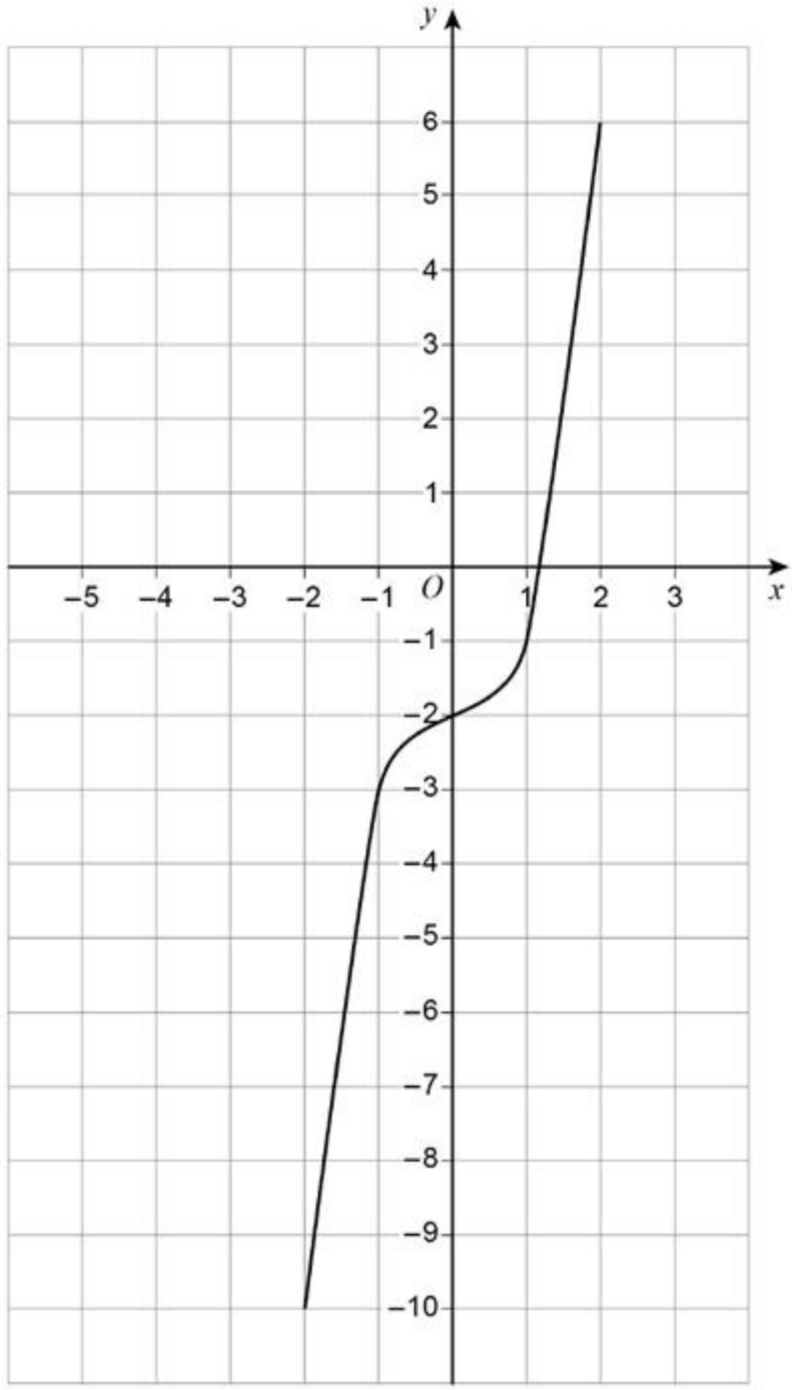
(Total 3 marks)

Q24.

Here is a sketch of $y = f(x)$

The curve passes through the points

(–2, –10) (–1, –3) (0, –2) (1, –1) (2, 6)



On the grid, sketch the curve $y = f(x + 2)$

(Total 2 marks)

Mark schemes

Q1.

$x^2 + y^2 = 25$

B1

[1]

Q2.

$$\frac{9}{25x}$$

B1

[1]

Q3.

$(-3, 5)$

B1

[1]

Q4.

$4x^2 - 10x + 10x - 25$
or $4x^2 - 25$
or $6x^2 + 14x - 15x - 35$
or $6x^2 - x - 35$
or $6x^2 + 14x + 15x + 35$
or $6x^2 + 29x + 35$

Allow one error

M1

$4x^2 - 10x + 10x - 25$
or $4x^2 - 25$
or $6x^2 + 14x - 15x - 35$
or $6x^2 - x - 35$
or $6x^2 + 14x + 15x + 35$
or $6x^2 + 29x + 35$

Fully correct

A1

$12x^3 + 28x^2 - 75x - 175$

A1

[3]

Q5.

(a) $3y(3y^2 - 2)$ or $-3y(2 - 3y^2)$

B1 $3(3y^3 - 2y)$ or $y(9y^2 - 6)$
or $-3(2y - 3y^3)$ or $-y(6 - 9y^2)$

B2

(b) $(3x - 1)(x - 7)$ or $(1 - 3x)(7 - x)$

B1 $(3x + a)(x + b)$

where $ab = 7$ or $a + 3b = -22$

or $(a - 3x)(b - x)$

where $ab = 7$ or $a + 3b = 22$

B2

[4]

Q6.

$10(3x + 1)$
or $9x$
or $x(9 - 3x - 1)$ or $x(8 - 3x)$
or $(10 - x)(3x + 1)$
or $x(3x + 1)$
or $(10 - x)(9 - 3x - 1)$

oe

One correct area expression in x

May be implied

M1

$10(3x + 1) + x(9 - 3x - 1)$
or $9x + (10 - x)(3x + 1)$
or $(10 - x)(3x + 1) + x(9 - 3x - 1) + x(3x + 1)$
or $10 \times 9 - (10 - x)(9 - 3x - 1)$

oe

Fully correct unsimplified expression for area

M1dep

$30x + 10 + 9x - 3x^2 - x$
or $9x + 30x + 10 - 3x^2 - x$
or $30x + 10 - 3x^2 - x + 9x - 3x^2 - x + 3x^2 + x$
or $90 - 90 + 30x + 10 + 9x - 3x^2 - x$
or $38x + 10 - 3x^2$

oe

Dep on M1 M1

Full expansion

All brackets removed

M1dep

$3x^2 - 38x + 55 (= 0)$

oe 3-term equation

A1

$(3x - 5)(x - 11)$

$$\frac{--38 \pm \sqrt{(-38)^2 - 4 \times 3 \times 55}}{2 \times 3}$$

or $\dfrac{38 \pm \sqrt{1444 - 660}}{6}$

or $\frac{38 \pm \sqrt{784}}{6}$

oe

their 3-term quadratic factorised correctly or correct substitution in formula for their 3-term quadratic equation

M1

$\frac{5}{3}$ or $1\frac{2}{3}$ or 1.66(6...) or 1.67

oe

x = 11 included is A0

A1

[6]

Q7.

Alternative method 1

$4x^2 + 6xy + 6xy + 9y^2$

oe *Allow one error*

Implied by $4x^2 + 12xy + \ldots$ *or* $\ldots + 12xy + 9y^2$

M1

$4x^2 + 6xy + 6xy + 9y^2$ or $4x^2 + 12xy + 9y^2$

oe *Fully correct*

A1

$4x^3 + 6x^2y + 6x^2y + 9xy^2$
or $4x^3 + 12x^2y + 9xy^2$
or $-16x^2 - 24xy - 24xy - 36y^2$
or $-16x^2 - 48xy - 36y^2$

oe

ft correct multiplication of their expansion by x or by −4 if their expansion for first M1 has at least 3 terms after simplification

M1dep

$4x^3 + 12x^2y + 9xy^2 - 16x^2 - 48xy - 36y^2$

ft M1A0M1 if their first expansion has at least 3 terms after simplification

A1ft

Alternative method 2

$2x^2 + 3xy - 8x - 12y$

oe *Allow one error*

eg $2x^2 + 3xy - 8x + 12y$

M1

$2x^2 + 3xy - 8x - 12y$

oe *Fully correct*

A1

$4x^3 + 6x^2y - 16x^2 - 24xy$ or (+) $6x^2y + 9xy^2 - 24xy - 36y^2$

oe ft correct multiplication of their expansion by 2x or by 3y if their expansion for first M1 has at least 3 terms after simplification

M1dep

$4x^3 + 12x^2y + 9xy^2 - 16x^2 - 48xy - 36y^2$

ft M1A0M1 if their first expansion has at least 3 terms after simplification

A1ft

[4]

Q8.

(a) (180, 0)

B1

Additional Guidance

Condone degrees symbol on 180

Condone (π, 0)

B1

(b) (−270, 1)

B1

Additional Guidance

Condone degrees symbol on 270

Condone $\left(\frac{-3\pi}{2}, 1\right)$

B1

[2]

Q9.

(a) $x^2 + (3x + p)^2 = 53$

oe

M1

$9x^2 + 3xp + 3xp + p^2$

or $9x^2 + 6xp + p^2$

Expands $(3x + p)^2$ correctly

M1

$x^2 + (3x + p)^2 = 53$

and $x^2 + 9x^2 + 3xp + 3xp + p^2 = 53$

and $10x^2 + 6px + p^2 - 53 = 0$

or

$x^2 + (3x + p)^2 = 53$

and $x^2 + 9x^2 + 6xp + p^2 = 53$

and $10x^2 + 6px + p^2 - 53 = 0$

A1

(b) $7 = 3 \times 2 + p$ or $7 = 6 + p$
or $p = 1$

oe

Substitutes x = 2 into given equation

$10(2)^2 + 6p(2) + p^2 - 53 = 0$

or $p^2 + 12p - 13 = 0$

or $(p - 1)(p + 13)$

or $p = 1$ (and $p = -13$)

M1

$10x^2 + 6x + 1 - 53$ (= 0)
or $10x^2 + 6x - 52$ (= 0)
or $5x^2 + 3x - 26$ (= 0)

oe equation

Substitutes their p into given equation

M1dep

$(5x + 13)(x - 2)$

or $\dfrac{-3 \pm \sqrt{3^2 - 4 \times 5 \times -26}}{2 \times 5}$

or $-\dfrac{3}{10} \pm \sqrt{\dfrac{529}{100}}$

oe

Correct factorisation of their 3-term quadratic
or correct substitution in formula for their 3-term quadratic
or correct completion of square to expression for x

M1

(x =) -2.6

oe

A1

$(-2.6, -6.8)$

oe

A1

or $\dfrac{--39 \pm \sqrt{(-39)^2 - 4 \times 5 \times 58}}{2 \times 5}$

or $\dfrac{39}{10} \pm \sqrt{\dfrac{361}{100}}$

M1dep

Q10.

$4^2 + y^2 = 80$

or $y = \sqrt{64}$

oe

May be implied from 8 on diagram

M1

$y = –8$

Accept (4, –8)

A1

$\frac{\text{their } -8}{4}$ or –2

oe

gradient of radius OP

M1

–1 ÷ their –2 or $\frac{1}{2}$

or –1 ÷ their gradient

gradient of tangent at P

M1

$y = \frac{1}{2}x - 10$

or $y + 8 = \frac{1}{2}(x - 4)$

oe

Ignore further working

A1

[5]

Q11.

$3(x - 2)$ or $x^3(x^2 - 4)$

or $x^2(x^3 - 4x)$ or $x(x^4 - 4x^2)$

or $(x^4 + 2x^3)(x - 2)$

or $x^3(x + 2)(x - 2)$

or $x^2(x^2 + 2x)(x - 2)$

or $x(x^3 + 2x^2)(x - 2)$

numerator or denominator factorised

oe eg $x^2(x + 2)(x^2 - 2x)$

M1

$3(x - 2)$ and $x^3(x + 2)(x - 2)$

or

$3(x - 2)$ and $(x^4 + 2x^3)(x - 2)$

or

$3(x - 2)$ and $x^2(x^2 + 2x)(x - 2)$

or

$3(x - 2)$ and $x(x^3 + 2x^2)(x - 2)$

numerator and denominator factorised each with factor $(x - 2)$

A1

$\frac{x^3(x+2)}{3}$ or $\frac{x^2(x^2+2x)}{3}$

$\frac{x(x^3+2x^2)}{3}$ or $\frac{x^4+2x^3}{3}$

oe fully simplified expression

eg $\frac{1}{3}x^3(x + 2)$ or $\frac{x^4}{3} + \frac{2x^3}{3}$

A1

M1A1A0

$\frac{x^3 \times (x+2)}{3}$ or $\frac{1}{3} \times x^3(x + 2)$

M1A1A0

$3 \times (x - 2)$ and $x^3 \times (x + 2) \times (x - 2)$

M1A1

$3 \times (x - 2)$ or $x^3 \times (x^2 - 4)$

M1

$1(3x - 6)$ or $-1(6 - 3x)$

M0

$-3(2 - x)$

M1

$-3(2 - x)$ and $-x^3(x + 2)(2 - x)$

M1A1

[3]

Q12.

(a) **Alternative method 1**

$(x + 3)^2 - 1$

M1

$x^2 + 3x + 3x + 9 - 1$

or $x^2 + 6x + 8$

oe **M1**

$b = 6$ and $c = 8$

SC1 $b = 6$ or $c = 8$ **A1**

Alternative method 2

$(x - 3)^2 + b(x - 3) + c = x^2 - 1$ **M1**

$x^2 - 6x + 9 + bx - 3b + c = x^2 - 1$ **M1**

$b = 6$ and $c = 8$

SC1 $b = 6$ or $c = 8$ **A1**

(b) $y = 1 - x^2$ or $y = -x^2 + 1$

oe equation **B1**

Additional Guidance

$-y = x^2 - 1$ **B1**

$y = -(x^2 - 1)$ **B1**

$y = -(x - 1)(x + 1)$ **B1**

$y = 1 - (-x)^2$ **B1**

$y = 1 - x^2$ in working with answer) $1 - x^2$ **B0**

$y\ (-x)^2 + 1$ **B0**

$f(x) = 1 - x^2$ **B0**

[4]

Q13.

Alternative method 1

$4x^2 + 5x + 3 = x + 2$ **M1**

$4x^2 + 5x - x + 3 - 2\ (= 0)$

or $4x^2 + 4x + 1$ (= 0)

oe collection of terms

eg $4x^2 + 5x - x = 2 - 3$

or $4x^2 + 4x = -1$

M1dep

$(2x + 1)(2x + 1)$ (= 0)

oe

or $4\left(x+\frac{1}{2}\right)^2$ (=0)

eg $\left(x+\frac{1}{2}\right)^2$ (= 0)

or $\frac{-4 \pm \sqrt{4^2 - 4 \times 4 \times 1}}{2 \times 4}$

or $b^2 - 4ac = 4^2 - 4 \times 4 \times 1$

allow $b^2 - 4ac = 16 - 16$

or D(iscriminant) = $4^2 - 4 \times 4 \times 1$

or D(iscriminant) = 16 − 16

A1

$(x =) -\frac{1}{2}$ with no other solutions with M2A1 seen

oe

or

states that as brackets are the same there is only one solution with M2A1 seen

or

$b^2 - 4ac = 4^2 - 4 \times 4 \times 1 = 0$ and states there is only one solution with M2A1 seen

allow $b^2 - 4ac = 16 - 16 = 0$ *and states there is only one solution with M2A1 seen*

or

D(iscriminant) = $4^2 - 4 \times 4 \times 1 = 0$ and states there is only one solution with M2A1 seen

allow D(iscriminant) = 16 − 16 = 0 and states there is only one solution with M2A1 seen

A1

oe

or $4\left(y-\frac{3}{2}\right)^2$ (= 0)

eg $4\left(y-\frac{3}{2}\right)^2$ *(= 0)*

or

Q14.

$\frac{x}{x+35} = \frac{5}{12}$

or

$\frac{35}{x+35} = \frac{7}{12}$

or

$\frac{x}{35} = \frac{5}{7}$

or

x : 35 = 5 : 7

or

links $\frac{7}{12}$ to 35

oe

eg x + 35 = 60

or

links $\frac{1}{12}$ to 5

M1

12x − 5x = 175

or 7x = 175

or 420 − 245 = 7x

or (x =) 25 or $\frac{25}{60}$

oe

collects terms

25 may be seen in section labelled x on Venn diagram

M1dep

(y =) 150 − 47 − 35 − their 25

or 43

dep on M2

43 may be seen in section labelled y on Venn diagram

M1dep

$\frac{43}{150}$ or 0.286... or 0.287 or 0.29

or 28.6...% or 28.7% or 29%

A1

[4]

Q15.

Alternative method 1

Any two of

$x(x - 2)$ and $7(x + 4)$

and $(x - 2)(x + 4)$

oe

$x(x - 2)$ and $7(x + 4)$ cannot be denominators

M1

correct equation including

$x(x - 2)$ and $7(x + 4)$

and $(x - 2)(x + 4)$

M1dep

$x^2 - 2x + 7x + 28 = x^2 + 4x - 2x - 8$

oe *all brackets must be expanded*

M1dep

-12

A1

Alternative method 2

$\dfrac{x(x-2)}{x+4} + 7 = x - 2$

M1

$\dfrac{x(x-2)}{x+4} = x - 9$

or $x(x - 2) = (x - 9)(x + 4)$

M1dep

$x^2 - 2x = x^2 - 9x + 4x - 36$

oe *all brackets must be expanded*

M1dep

-12

A1

Alternative method 3

$x + \dfrac{7(x+4)}{x-2} = x + 4$

M1

$\frac{7(x+4)}{x-2}$ = 4

or $7(x + 4) = 4(x - 2)$

M1dep

$7x + 28 = 4x - 8$

oe all brackets must be expanded

M1dep

−12

A1

Additional Guidance

In Alt 1, do not allow $x \times x - 2$ or $7 \times x + 4$ unless recovered

[4]

Q16.

(a) Ticks No and gives valid reason

eg valid reasons

could use formula

could complete the square

could use $\frac{-3 \pm \sqrt{29}}{2}$

B1

Additional Guidance

Any working or solutions shown must be correct

If the quadratic formula is written down it must be correct

Ignore irrelevant non-contradictory statements

Ticks No and ‘There are other methods’

B1

Ticks No and ‘a and b could be decimals’

B1

Ticks No and ‘She could draw a graph’

B1

Ticks No and ‘All quadratic equations can be solved (even if the solutions aren’t real numbers)’

B1

Ticks No and ‘The discriminant is positive’

B1

Ticks No and ‘Not all quadratics factorise’

B0

Ticks No and ‘It does factorise’

B0

Ticks Yes

B0

(b) $(x + 3)^2 = \frac{4}{9}$

oe

or $\sqrt{9}\ (x + 3) = (\pm)\sqrt{4}$

or $3(x + 3) = (\pm)2$

or $\left((x+3)+\frac{2}{3}\right)\left((x+3)-\frac{2}{3}\right)$

M1

$x + 3 = \pm\sqrt{\frac{4}{9}}$

or $3x = \pm 2 - 9$

or $x + 3 = \pm\frac{2}{3}$

oe eg $(x =) -3 \pm \sqrt{\frac{4}{9}}$

$(x =)\ \frac{2}{3} - 3$ *and* $(x =) -\frac{2}{3} - 3$

M1dep

$-\frac{7}{3}$ and $-\frac{11}{3}$

with correct working for M1M1

allow equivalent fractions or recurring decimals or mixed numbers

A1

Additional Guidance

For up to M1M1, allow 0.66... or 0.67 for $\frac{2}{3}$ and –2.33... for $-\frac{7}{3}$

and –3.66... or –3.67 for $-\frac{11}{3}$

Answers –2.33... and –3.66... or –3.67 with correct working

M1M1A0

$(x =)\ -\frac{7}{3}$ and $(x =)\ -\frac{11}{3}$ with no correct working

M0M0A0

Do not allow incorrect conversion of correct solutions

M1M1A0

Allow $3(x + 3) = (\pm)\ 2$ followed by $3x + 9 = (\pm)\ 2$ etc as a correct method even though it includes a bracket expansion

[4]

Q17.

$\frac{6n^2}{n} + 2n^3$ or $6n + 2n^3$

or $6n^3 - 6n$

expands one bracket correctly

allow $3 \times 2n$ for $\frac{6n^2}{n}$

M1

$\frac{6n^2}{n} + 2n^3 + 6n^3 - 6n$

or

$6n + 2n^3 + 6n^3 - 6n$

fully correct expansion

allow $3 \times 2n$ for $\frac{6n^2}{n}$

M1dep

$8n^3 + (2n)^3$

must have seen M1M1

oe eg $8n^3$ and $2n \times 2n \times 2n$

or $8n^3$ and $\sqrt[3]{8n^3} = 2n$

condone $8n^3$ and 2^3n^3

Additional Guidance

Do not allow $\frac{2n^2 \times 3}{n}$ for $\frac{6n^2}{n}$

[3]

Q18.

(a) 300

B1

(b) 240

B1

[2]

Q19.

$y(x - 4) = 2x + 3$

$x(y - 4) = 2y + 3$

M1

$yx - 4y = 2x + 3$

$xy - 4x = 2y + 3$

M1dep

$yx - 2x = 4y + 3$

or $x(y - 2) = 4y + 3$

or $x = \dfrac{4y+3}{y-2}$

$xy - 2y = 4x + 3$

or $y(x - 2) = 4x + 3$

M1dep

$\dfrac{4x+3}{x-2}$

oe

Must be in terms of x

A1

Additional Guidance

Ignore any attempt to give the domain of f^{-1}

[4]

Q20.

(a) $-k$

B1

(b) k

B1

[2]

Q21.

$\dfrac{x^2-2}{x^2-2+2}$ or $\dfrac{x^2-2}{x^2}$

M1

$\dfrac{x^2}{x^2} - \dfrac{2}{x^2}$ or $1 - \dfrac{2}{x^2}$

implied by correct final answer

must be two terms

oe eg $x^2x^{-2} - 2x^{-2}$

A1

$1 - 2x^{-2}$

or

$a = 1$ and $b = -2$ and $n = -2$

A1

[3]

Q22.

(a) -0.3 or $-\frac{3}{10}$

B1

-0.2027 or $-\frac{2027}{10\,000}$

ft their −0.3

B1ft

Additional Guidance

ft answer must be to at least 4 decimal places

Note: if their −0.3 is −0.2027, then ft answer is −0.200 832 8...

(b) -0.20081

B1

Additional Guidance

Answer must be to exactly 5 decimal places

-0.20083

B0

[3]

Q23.

$\frac{1}{64} = k^3$ or $\sqrt[3]{\frac{1}{64}}$

oe equation in k

M1

$(k =) \frac{1}{4}$ or $(k =)\ 0.25$

must see working for M1

implied by $y = \left(\frac{1}{4}\right)^x$

$\left(\frac{1}{4}\right)^3 = \frac{1}{64}$ *is M1A1*

A1

$\left(\frac{1}{4}\right)^{\frac{1}{2}} = \frac{1}{2}$ or $0.25^{\frac{1}{2}} = 0.5$

must see working for M1A1

allow $\sqrt{\frac{1}{4}} = \frac{1}{2}$ *or* $\sqrt{0.25} = 0.5$

A1

[3]

Q24.

Plots at least three of

(0, 6) (−1, −1) (−2, −2)

(−3, −3) (−4, −10)

points may be implied by a curve passing through the points
tolerance ±2 mm

M1

Plots (0, 6) (−1, −1) (−2, −2)

(−3, −3) (−4, −10) and joins with a smooth curve

points may be implied by a curve passing through the points
tolerance ±2 mm

A1

Additional Guidance

Draws $y = \text{f}(x - 2)$ or $y = \text{f}(x) + 2$ or $y = \text{f}(x) - 2$

M0A0

[2]