



ACHIEVE ACADEMY

GCSE Maths — Higher Tier

Non-Linear Simultaneous Equations · Practice Booklet

NAME: _____

CLASS: _____

DATE: _____

☐ Developing

☒ Secure

☐ Greater Depth

Answer every question in the working space provided. Method marks are available for correct working even if the final answer is wrong. Check the time allowed with your tutor before you start.

Non-Linear Simultaneous Equations

Total marks available: 134

● Non-Linear Simultaneous Equations

Q1

[3 marks]

A line has equation $y = t - 2$ and a curve has equation $y = 3t^2 - 5t - 2$. By substituting the linear equation into the curve's equation, show that $3t^2 - 6t = 0$.

Q2

[3 marks]

A line has equation $y = t + 2$ and a curve has equation $y = 3t^2 + 4t - 4$. By substituting the linear equation into the curve's equation, show that $3t^2 + 3t - 6 = 0$.

Q3

[3 marks]

A line has equation $y = a + 5$ and a curve has equation $y = 4a^2 + 5a - 6$. By substituting the linear equation into the curve's equation, show that $4a^2 + 4a - 11 = 0$.

Q4

[5 marks]

Solve the simultaneous equations $y = 2t - 9$ and $y = t^2 - 2t - 21$.

Q5

[5 marks]

Solve the simultaneous equations $y = -4t - 7$ and $y = t^2 - 11t - 7$.

Q6

[3 marks]

A line has equation $y = t - 4$ and a curve has equation $y = 3t^2 + 6t + 7$. By substituting the linear equation into the curve's equation, show that $3t^2 + 5t + 11 = 0$.

Q7

[3 marks]

A line has equation $y = a - 4$ and a curve has equation $y = 2a^2 - 6a - 4$. By substituting the linear equation into the curve's equation, show that $2a^2 - 7a = 0$.

Q8

[5 marks]

Solve the simultaneous equations $y = 5t + 3$ and $y = t^2 + 6t - 3$.

Q9

[5 marks]

Solve the simultaneous equations $y = 6a + 1$ and $y = a^2 + 10a - 20$.

Q10

[5 marks]

Solve the simultaneous equations $y = -a - 9$ and $y = a^2 - 2a - 29$.

Q11

[5 marks]

Solve the simultaneous equations $y = -4t + 7$ and $y = t^2 - 3t - 7$, giving your answers to 2 decimal places.

Q12

[5 marks]

Solve the simultaneous equations $y = 3t + 1$ and $y = 2t^2 + 13t + 13$.

Q13

[5 marks]

Solve the simultaneous equations $y = -2x + 1$ and $y = 3x^2 - 2x - 11$.

Q14

[5 marks]

Solve the simultaneous equations $y = -3a - 4$ and $y = a^2 - 9a - 7$, giving your answers to 2 decimal places.

Q15

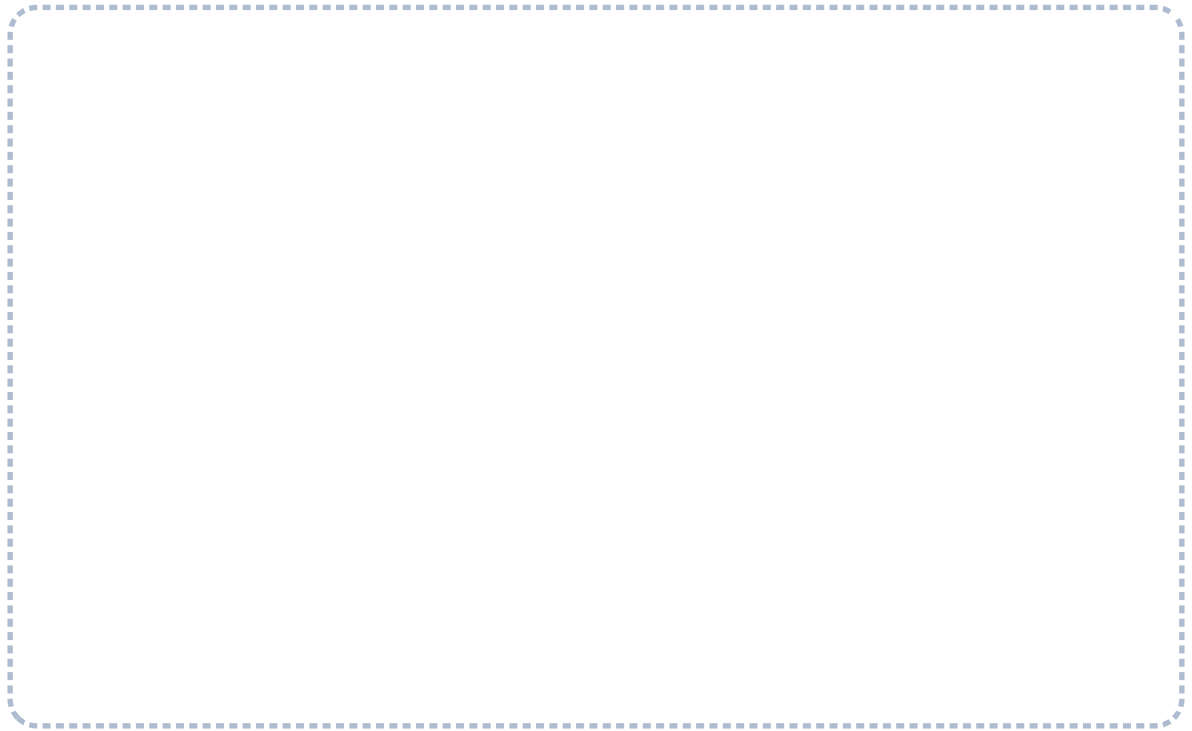
[5 marks]

Solve the simultaneous equations $y = -3t + 4$ and $y = t^2 + 3t - 8$, giving your answers to 2 decimal places.

Q16

[5 marks]

Solve the simultaneous equations $y = -4x - 4$ and $y = x^2 - x - 9$, giving your answers to 2 decimal places.



Q17

[5 marks]

Solve the simultaneous equations $y = -5x - 2$ and $y = 3x^2 - 5x - 110$.

Q18

[4 marks]

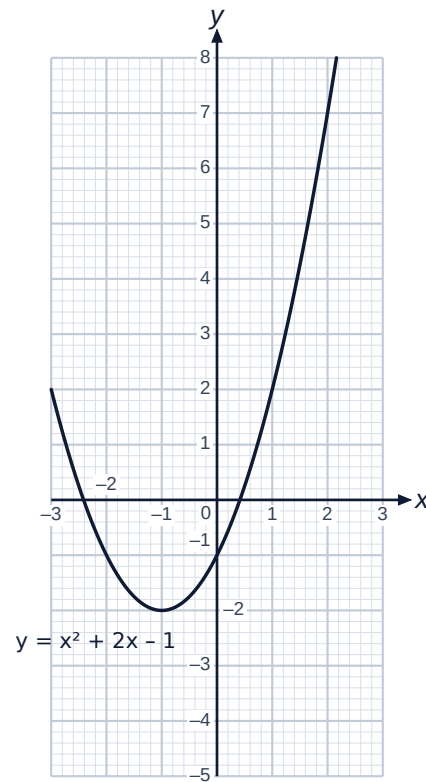
The graph of $y = x^2 + 2x - 1$ is drawn on the grid.

(a) On the same grid, draw the line $y = 2x$.

(b) Use your graphs to solve the simultaneous equations

$$y = x^2 + 2x - 1$$

$$y = 2x$$



Q19

[4 marks]

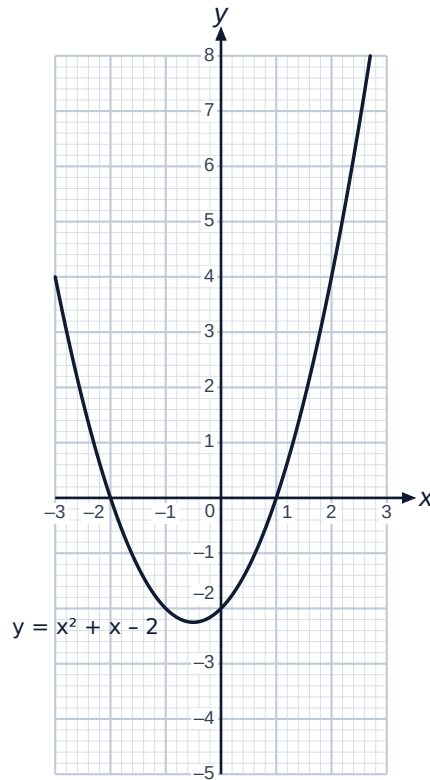
The graph of $y = x^2 + x - 2$ is drawn on the grid.

(a) On the same grid, draw the line $y = 2x$.

(b) Use your graphs to solve the simultaneous equations

$$y = x^2 + x - 2$$

$$y = 2x$$



Q20

[4 marks]

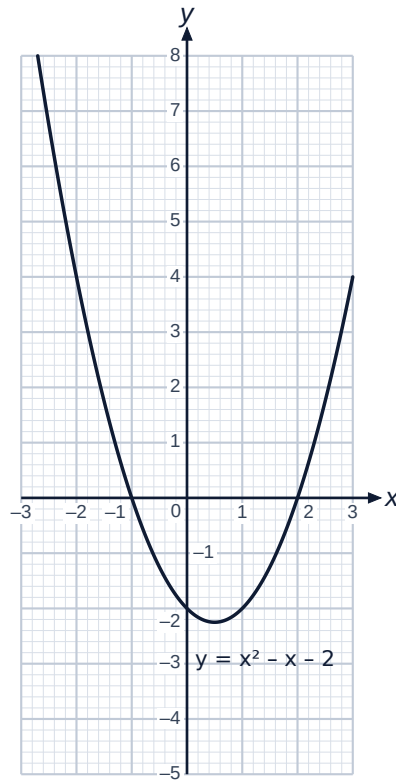
The graph of $y = x^2 - x - 2$ is drawn on the grid.

(a) On the same grid, draw the line $y = -x$.

(b) Use your graphs to find estimates for the solutions of the simultaneous equations

$$y = x^2 - x - 2$$

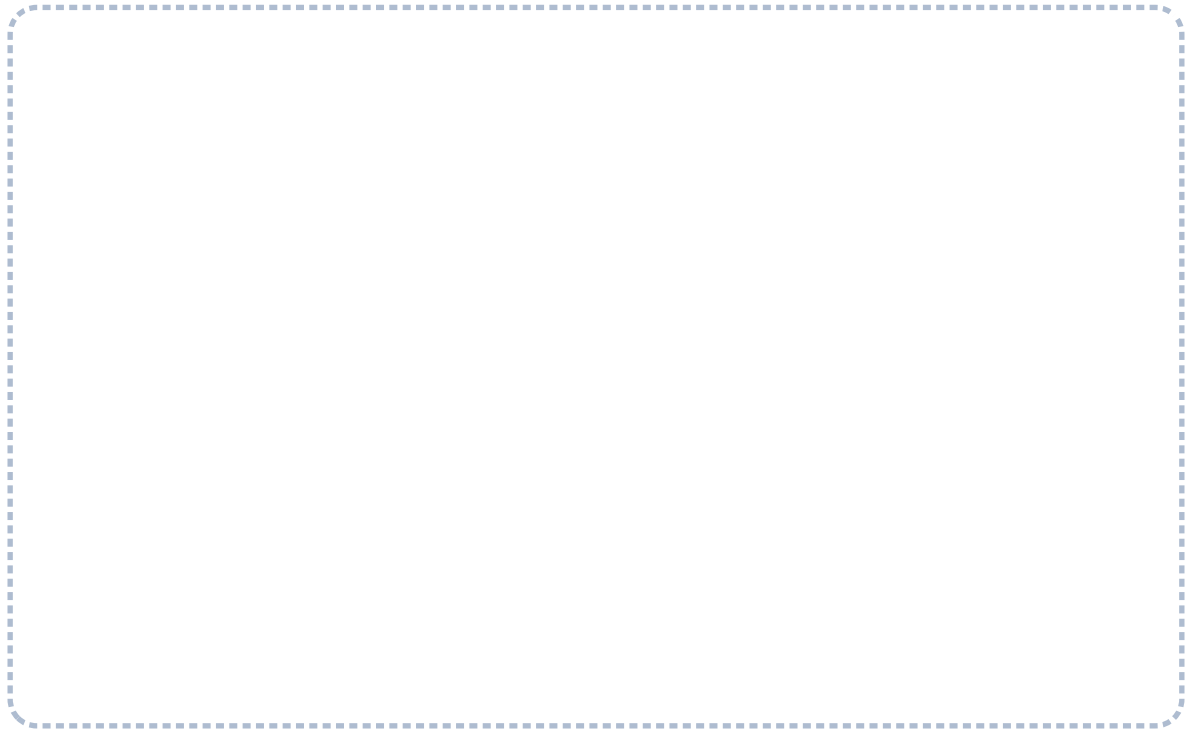
$$y = -x$$



Q21

[5 marks]

Show that the line $y = 3a + 1$ is a tangent to the curve $y = 4a^2 + 11a + 5$, and find the coordinates of the point where they touch.



Q22

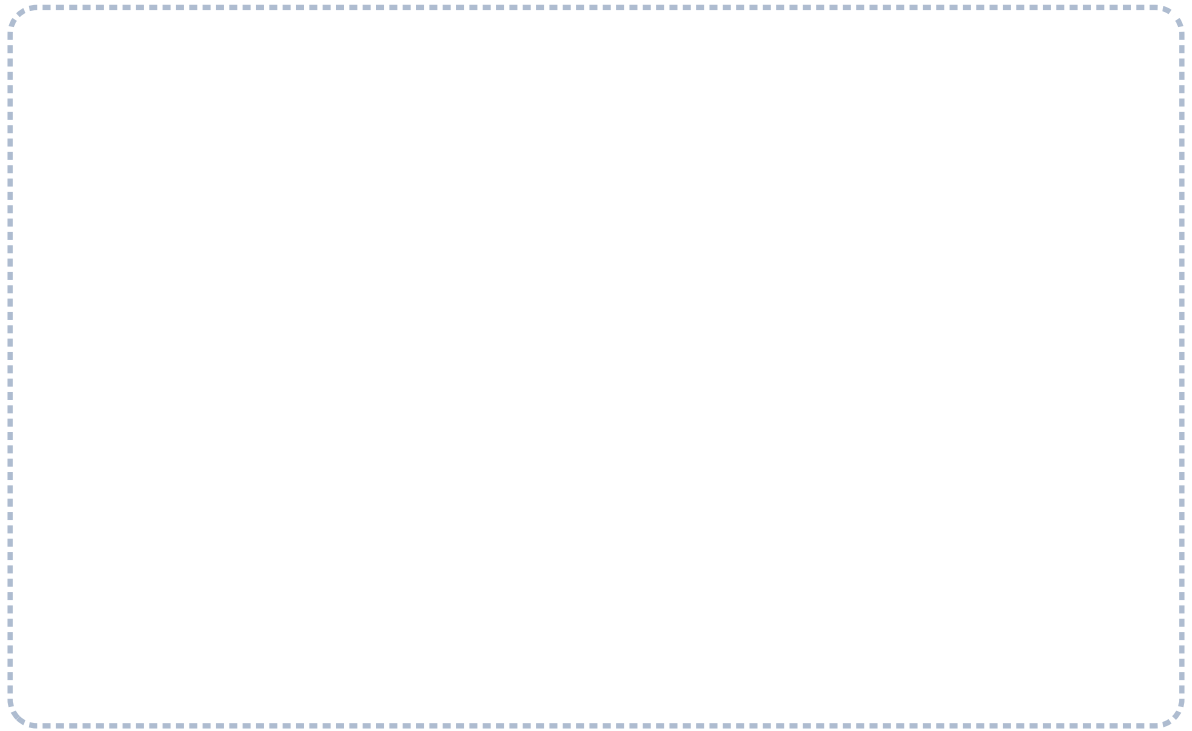
[5 marks]

Show that the line $y = -5a - 2$ is a tangent to the curve $y = 3a^2 - 29a + 46$, and find the coordinates of the point where they touch.

Q23

[5 marks]

Show that the line $y = a$ is a tangent to the curve $y = 3a^2 - 29a + 75$, and find the coordinates of the point where they touch.



Q24

[5 marks]

Solve the simultaneous equations $y = 2t - 8$ and $y = 2t^2 - 5t - 9$, giving your answers to 2 decimal places.

Q25

[4 marks]

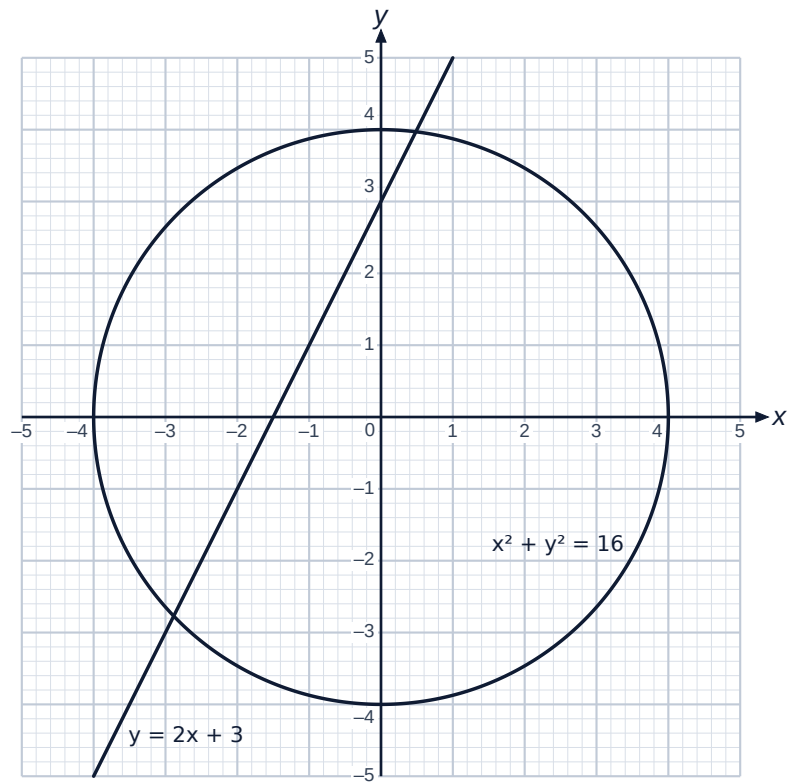
The graphs of $x^2 + y^2 = 16$ and $y = 2x + 3$ are drawn on the grid.

Use the graphs to find estimates for the solutions of the simultaneous equations

$$x^2 + y^2 = 16$$

$$y = 2x + 3$$

Give your values to 1 decimal place.



Q26

[5 marks]

Solve the simultaneous equations $y = 5a + 1$ and $y = 2a^2 - 2a - 4$, giving your answers to 2 decimal places.

Q27

[4 marks]

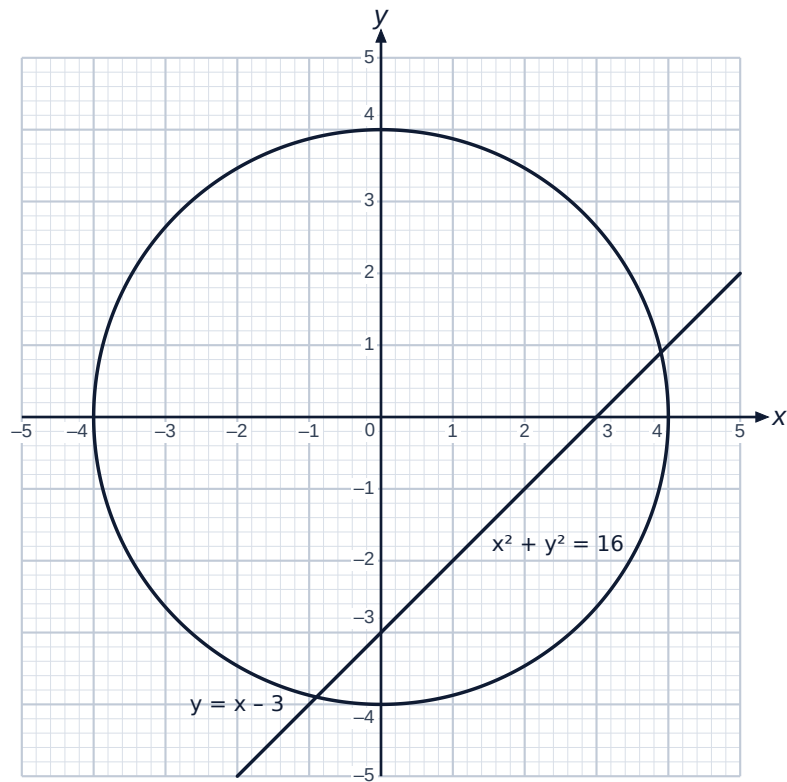
The graphs of $x^2 + y^2 = 16$ and $y = x - 3$ are drawn on the grid.

Use the graphs to find estimates for the solutions of the simultaneous equations

$$x^2 + y^2 = 16$$

$$y = x - 3$$

Give your values to 1 decimal place.



Q28

[5 marks]

Show that the line $y = -2a - 4$ is a tangent to the curve $y = 3a^2 + 10a + 8$, and find the coordinates of the point where they touch.

Q29

[5 marks]

Solve the simultaneous equations $y = 2a + 6$ and $y = 3a^2 - 3a - 8$, giving your answers to 2 decimal places.

Q30

[4 marks]

The graphs of $x^2 + y^2 = 25$ and $y = \frac{1}{2}x - 2$ are drawn on the grid.

Use the graphs to find estimates for the solutions of the simultaneous equations

$$x^2 + y^2 = 25$$

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

Give your values to 1 decimal place.

