

### Slightly More Difficult Simultaneous Equations

Solve algebraically the simultaneous equations

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

$$2x + 3y = 1$$

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$$2x = 1 - 3y$$

Square both sides

$$4x^2 = 1 - 6y + 9y^2$$

Multiply the first equation by 2.

$$4x^2 - 2y^2 = 2$$

Substitute into this equation.

$$1 - 6y + 9y^2 - 2y^2 = 2$$

Simplify

$$7y^2 - 6y - 1 = 0$$

Factorise

$$(7y + 1)(y - 1) = 0$$

$$y = -\frac{1}{7} \text{ or } y = 1$$

$$x = \frac{1 - 3y}{2}$$

$$x = \frac{1\frac{3}{7}}{2} \text{ or } x = \frac{1-3}{2}$$

$$x = \frac{5}{7} \text{ and } y = -\frac{1}{7} \quad \text{or} \quad x = -1 \text{ and } y = 1$$

## Exercise

1)

$$3x^2 - 2y^2 = 3$$

$$3x + 4y = 3$$

2)

$$x^2 - 2y^2 = 4$$

$$3x + 4y = 2$$

3)

$$3x^2 + 2y^2 = 5$$

$$2x + 5y = 3$$

4)

$$4x^2 + 3y^2 = 7$$

$$5x - 2y = 1$$

Answers

1)

$$x = 1 \text{ and } y = 0$$

or

$$x = -\frac{11}{5} \text{ and } y = \frac{12}{5}$$

2)

$$x = 6 \text{ and } y = -4$$

3)

$$x = \frac{107}{83} \text{ and } y = \frac{7}{83}$$

or

$$x = -1 \text{ and } y = 1$$

4)

$$x = -\frac{5}{13} \text{ and } y = -\frac{19}{13}$$

or

$$x = \frac{5}{7} \text{ and } y = \frac{9}{7}$$