Solving Linear Equations

$3x - 5 = 5x$

$-5 = 2x$

$\frac{-5}{2} = x$

$x = -2.5$

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

$2x = 3(x-2)$

$2x = 3x - 6$

$-x = -6$

$x = 6$

$2x + 3 = 14$

$2x = 14 - 3$

$2x = 11$

$x = 5.5$

$10 - 2x = 6x + 18$

$10 = 8x + 18$

$-8 = 8x$

$-1 = x$

$x = -1$

$\frac{15}{x} = 5$

$15 = 5x$

$\frac{15}{5} = x$

$3 = x$

Linear graphs

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

The points (?, 5) and (5, ?) lie on the graph y=2x+1

2

11

$2 \times 5 + 1 = 11$

Complete the missing values.

Write down the equation of a line parallel to this graph

..and of one perpendicular

$5 = 2x + 1$

$4 = 2x$

$2 = x$

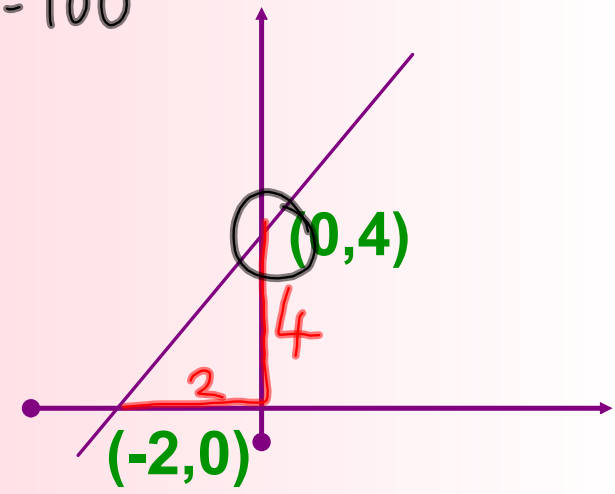
$y = 2x + 8$ $y = 2x + 5$ $y = 2x + 2$

$y = 2x - 100$

Write down the equation of the graph.

Write down the equation of a line parallel to the graph.

Write down an equation of a line perpendicular to the graph.



$y = 2x + 4$

$m = \frac{4}{2} = 2$

$y = 2x - 5$

1 $y = -\frac{1}{2}x + 8$

Algebra Revision

Quadratics:
How do you solve them?

Factorise
The formula
graph

Solve each of these, and sketch the graph by noting where they cross the x axis.

By factorising:

$x^2 + 9x - 22 = 0$

$(x-2)(x+11)=0$

$x-2=0$ or $x+11=0$

$x=2$ or $x=-11$

$x^2 - 6x + 9 = 0$

$(x-3)(x-3)=0$

$x-3=0$

$x=3$ (twice)

$2x^2 + x - 3 = 0$

$(2x+3)(x-1)=0$

$2x+3=0$ or $x-1=0$

$2x=-3$ $x=1$

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

$x^2 - 9 = 0$

$(x+3)(x-3)=0$

$x+3=0$ or $x-3=0$

$x=-3$ or $x=+3$

By using the formula:

$x^2 + 9x - 22 = 0$ $a=1$ $b=9$ $c=-22$

$2x^2 + 6x - 1 = 0$

$2 - x - 6x^2 = 0$

problems and quadratics:
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$$(x+4)(x-5) = x^2 - 5x + 4x - 20$$

$$= x^2 - x - 20$$

$$(2x+3)(x-5) = 0$$

Solving quadratic equations

Solve the equation

$y = x^2 + 4x + 3 = 0$

$(x+1)(x+3) = 0$

$x+1=0$ or $x+3=0$

$x=-1$ or $x=-3$

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

Where does this graph cross the x axis?

Where do the following graphs cross the x axis?

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

$(x+3)(x-1) = 0$

$x = -3$ or $x = 1$

$y = x^2 - 9$

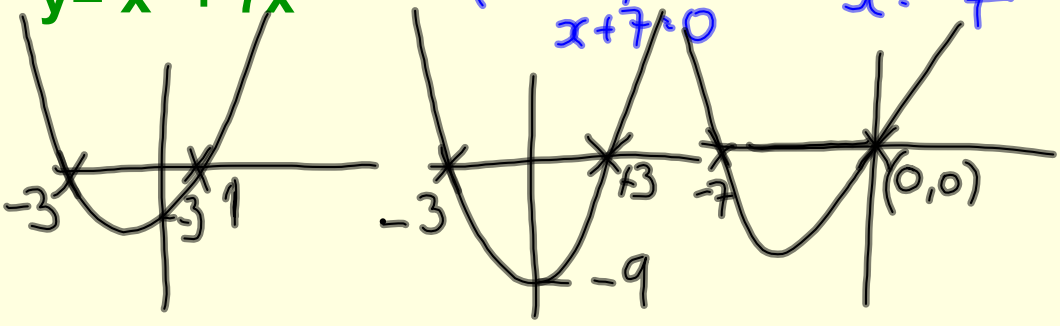
$(x+3)(x-3) = 0$ $x = \pm 3$

$y = x^2 + 7x$

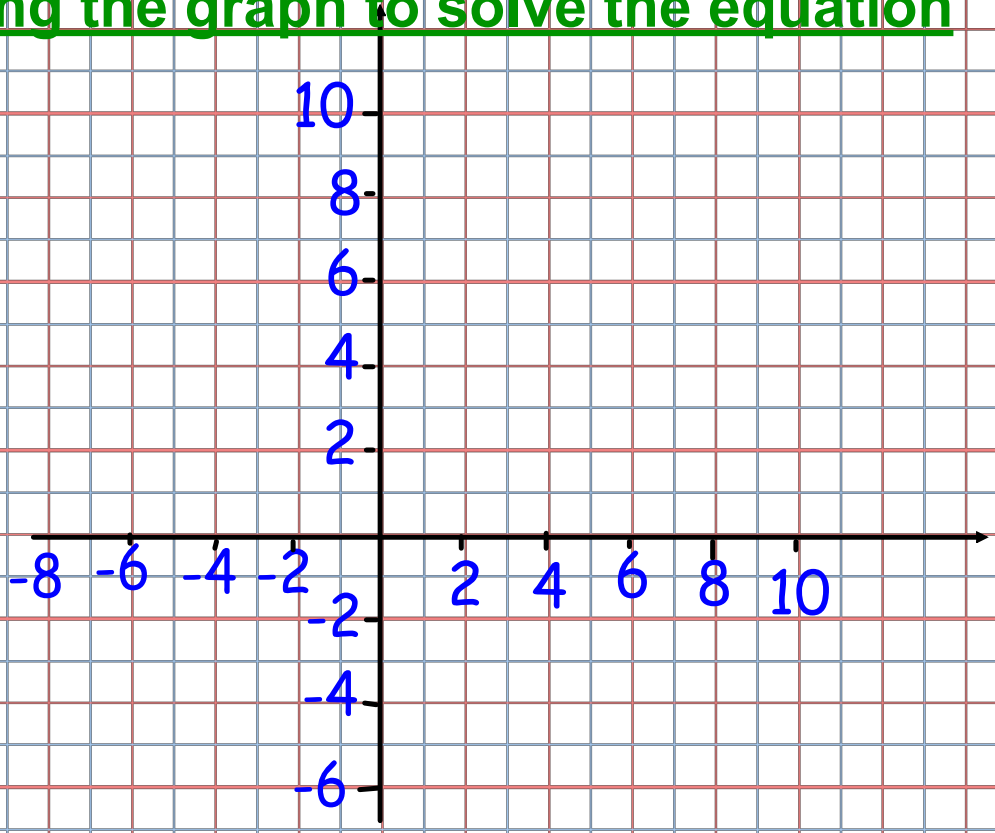
$x(x+7) = 0$

$x = 0$ $x = -7$

$x+7 = 0$



Using the graph to solve the equation



Draw the graph of $y=2x^2 - x -15$

Use your graph to solve the following equations:

a) $2x^2 - x -15 = 0$

b) $2x^2 - x -15 = 3$

c) $2x^2 - 20 = 0$

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Algebraic fractions

Simplify

$$\frac{3ab}{15a} = \frac{b}{5}$$

$$\frac{3}{15} = \frac{1}{5} \qquad \frac{1}{5}b$$

$$\frac{3a^2b}{15a^3b} = \frac{1}{5a}$$

$a \times a$, $a \times a \times a$ $\qquad \frac{1}{5}a^{-1}$

$$\frac{3a^2b^2}{15a^3b} = \frac{3b}{15a} = \frac{b}{5a}$$

$$\frac{a^2b^2 + b^2}{a^3b+b} = \frac{b^2(a^2+1)}{b(a^3+1)} = \frac{b(a^2+1)}{a^3+1}$$

$$\frac{a^2b^2 + ab^2}{a^3b+ab} = \frac{ab^2(a+1)}{ab(a^2+1)} = \frac{b(a+1)}{a^2+1}$$

$$\frac{a^2 - b^2}{a+b} = \frac{(a+b)(a-b)}{a+b} = a - b$$

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Adding fractions

$\frac{1}{5} + \frac{2}{3} = \frac{3+10}{15} = \frac{13}{15}$

$\frac{a}{3} + \frac{b}{4} = \frac{4a+3b}{12}$

$= \frac{4a}{12} + \frac{3b}{12}$

$\frac{4}{x} - \frac{5}{2x} = \frac{8-5}{2x} = \frac{3}{2x}$

$\frac{1}{a+b} + \frac{2}{a-b}$

$= \frac{a-b+2(a+b)}{(a+b)(a-b)}$

$= \frac{a-b+2a+2b}{(a+b)(a-b)}$

$= \frac{3a+b}{a^2-b^2}$

$\frac{3}{x^2-9} + \frac{x}{x+3}$

Solve:

$\frac{1}{x-1} - \frac{1}{x} = 8$

The sum of the reciprocals of two consecutive numbers is 7/12. Find the 2 numbers.

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Simultaneous equations

x= 4 y=-1

In the park are humans and dogs. There are 34 legs. There are 11 heads. How many dogs are there?

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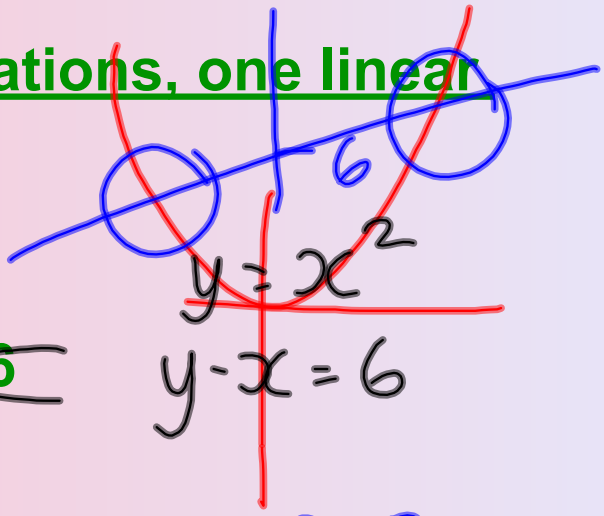
Simultaneous equations, one linear one quadratic

$x = y^2$

$x = y + 6$

$y = x^2$

$y = x + 6$



$x^2 = x + 6$

$x^2 - x - 6 = 0$

$(x + 2)(x - 3) = 0$

$x + 2 = 0$

$x = -2$ or $x = 3$

$y = 4$ or $y = 9$

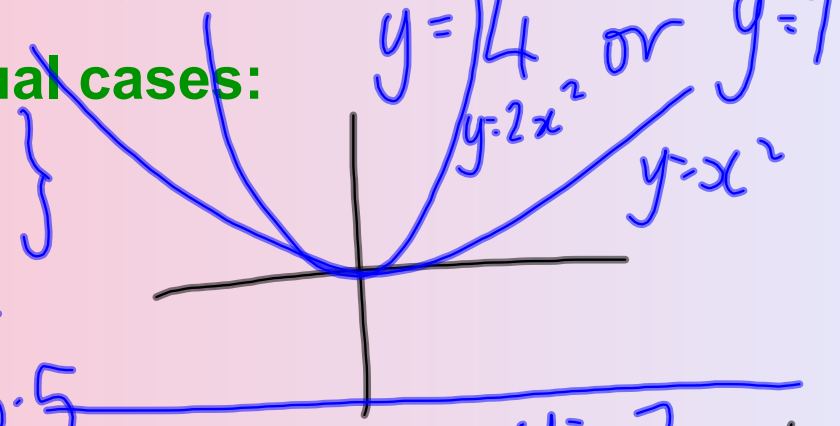
The two unusual cases:

$y = 2x^2$

$y = -7$

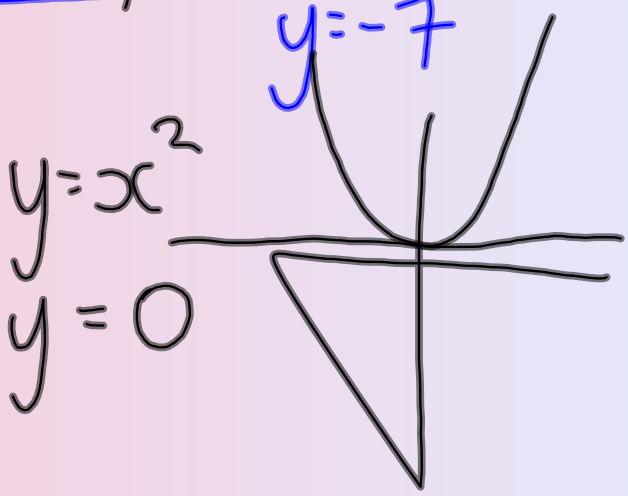
$2x^2 = -7$

$x^2 = -3.5$



$y = x^2$

$y = 2x - 1$



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