Quadratics

The **discriminant** is $b^2 - 4ac$

$b^2 - 4ac > 0$	2 Solutions
$b^2 - 4ac = 0$	1 Solution
$b^2 - 4ac < 0$	0 Solutions

Solving Quadratics

Factorise

The Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Complete the Square

Differentiation

times then minus

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

$$\frac{dy}{dx} = 12x^3 + 5$$

$\frac{dy}{dx}$ is the tangent's gradient

For the normal: flip and minus

Integration

Add then divide (don't forget to plus c!)

$$\frac{dy}{dx} = 12x^3 + 5$$

$$y = 3x^4 + 5x + c$$

Surds: Rationalising the Denominator

$$\frac{2}{\sqrt{3}+1}$$

$$\frac{2}{\sqrt{3}+1}\,\frac{(\sqrt{3}-1)}{(\sqrt{3}-1)}$$

$$\frac{2\sqrt{3}-2}{2}$$

$$\frac{2\sqrt{3}-2}{2}$$

$$\sqrt{3}-1$$

Indices

$$9^{\frac{1}{2}}=3 \qquad 9^{-1}=\frac{1}{9}$$

$$\sqrt{x}=x^{\frac{1}{2}} \qquad \frac{1}{x^{2}}=x^{-2}$$

Sequences and Series

$$U_n = a + (n-1)d$$

$$S_n = \frac{n}{2}\left(2a + (n-1)d\right)$$

$$a = the\ first\ number$$

$$d = the\ common\ difference$$

Up to term 3

$$\sum_{n=1}^{3} (2n+1) = 3 + 5 + 7 = 15$$

the sum

Starting with term 1

$$U_{n+1} = 2U_n + 2 \qquad U_1 = 4$$

$$U_2 = 2(4) + 2 = 10$$

$$U_3 = 2(10) + 2 = 22$$

Transformation of Graphs

$$y = f(x)$$

Inside the bracket changes the x, it does not do what it is told

$y = f(x - 2)$	$y = f(3x)$
Right 2	Divide x by 3

Outside the bracket changes the y, it does what it is told

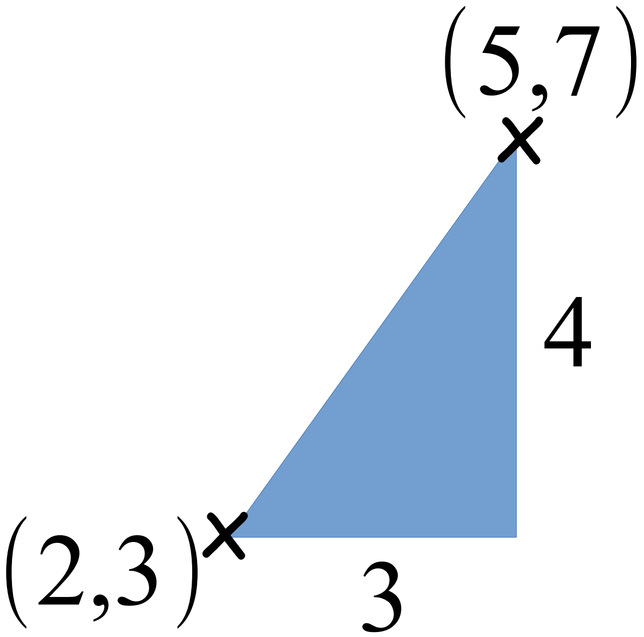
$y = f(x) + 5$	$y = 3f(x)$
Up 5	Multiply y by 3

Coordinate Geometry

$$y = mx + c$$

$$Gradient = \frac{y_2 - y_1}{x_2 - x_1}$$

Distance is Pythagoras



$$a^2 + b^2 = c^2$$

$$3^2 + 4^2 = c^2$$

$$\sqrt{25} = c$$

$$c = 5$$

Parallel means same gradient

Perpendicular: flip and minus