

Quadratic Inequalities

FORMULAE LIST

Circle:

The equation $x^2 + y^2 + 2gx + 2fy + c = 0$ represents a circle centre $(-g, -f)$ and radius $\sqrt{g^2 + f^2 - c}$.

The equation $(x-a)^2 + (y-b)^2 = r^2$ represents a circle centre (a, b) and radius r .

Scalar Product:

$\mathbf{a} \cdot \mathbf{b} = |\mathbf{a}| |\mathbf{b}| \cos \theta$, where θ is the angle between \mathbf{a} and \mathbf{b}

or $\mathbf{a} \cdot \mathbf{b} = a_1 b_1 + a_2 b_2 + a_3 b_3$ where $\mathbf{a} = \begin{pmatrix} a_1 \\ a_2 \\ a_3 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} b_1 \\ b_2 \\ b_3 \end{pmatrix}$.

Trigonometric formulae:

$$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$$

$$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$$

$$\sin 2A = 2 \sin A \cos A$$

$$\cos 2A = \cos^2 A - \sin^2 A$$

$$= 2 \cos^2 A - 1$$

$$= 1 - 2 \sin^2 A$$

Table of standard derivatives:

$f(x)$	$f'(x)$
$\sin ax$	$a \cos ax$
$\cos ax$	$-a \sin ax$

Table of standard integrals:

$f(x)$	$\int f(x) dx$
$\sin ax$	$-\frac{1}{a} \cos ax + c$
$\cos ax$	$\frac{1}{a} \sin ax + c$

Essential Skills 6

The skills in this series of worksheets appear frequently.

These are the GIFTS you must take to succeed



Solving Quadratic Inequalities

By sketching the parabola, solve:

1. $x^2 - 4x \geq 0$

2. $x^2 + 14x + 33 \leq 0$

3. $x^2 - x - 20 > 0$

4. $x^2 - 9x + 8 < 0$

5. $x^2 - 16 \geq 0$

6. $3x^2 - 27 \leq 0$

7. $2x^2 + 5x - 3 < 0$

8. $7 - 6x - x^2 \geq 0$

9. $4x^2 \geq 8x + 5$

10. $6 + 7x \leq 3x^2$



APPLYING QUESTIONS

1. Find the values of x for which the function $f(x) = x^3 + 5x^2 - 8x + 3$ is increasing.
2. $x^2 - (k - 2)x + 4 = 0$ has no real roots
Find the range of values for k .
3. A circle has equation $x^2 + y^2 - 2kx - ky - 7k + 3 = 0$.
Find the range of values for k .