CONCEPT MAP

FORM 4

QUADRATIC FUNCTIONS

Quadratic Equations

Solving quadratic equations by:

(a) Completing the square:
$(x + p)^2 = q$

(b) Quadratic formula:

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

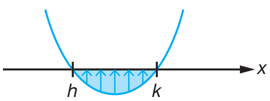
Forming Quadratic Equations from Roots

$x^2 - (\text{S.O.R.})x + (\text{P.O.R.}) = 0$
such that
S.O.R. = Sum of roots
P.O.R. = Product of roots

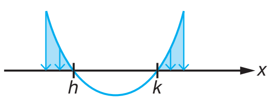
Types of Roots of Quadratic Equations

(a) Two real and distinct roots ($b^2 - 4ac > 0$)
(b) Two real and equal roots ($b^2 - 4ac = 0$)
(c) No real roots ($b^2 - 4ac < 0$)
(d) Two real roots ($b^2 - 4ac \geqslant 0$)

Solving Quadratic Inequalities



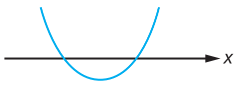
$(x - h)(x - k) < 0$
$h < x < k$



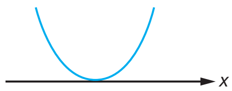
$(x - h)(x - h) > 0$
$x < h$ or $x > k$

Quadratic Functions

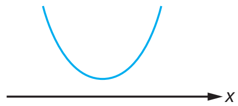
Relation between the position of quadratic function graphs and the nature of the roots of quadratic equations



Two distinct roots
$b^2 - 4ac > 0$



Two equal roots
$b^2 - 4ac = 0$



No real roots
$b^2 - 4ac < 0$

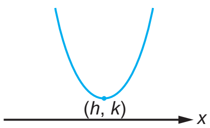
Determining the Vertex Form of Quadratic Functions

Converting $f(x) = ax^2 + bx + c$ to the vertex form $f(x) = a(x - h)^2 + k$ by completing the square

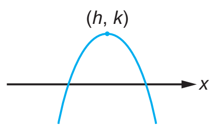
(a) If $a > 0$, the coordinates of the minimum point are (h, k).
(b) If $a < 0$, the coordinates of the maximum point are (h, k).

Sketching Graphs of Quadratic Functions

$f(x) = a(x - h)^2 + k$



$a > 0$



$a < 0$