Week Two – Sketching Quadratics

Warm-Up

Section A

Factorise each of these quadratics.

a $3x^2+7x+2$ **b** $6x^2+17x+12$ **c** $4x^2-13x+3$ **d** $2x^2-7x-15$

e $2x^2+3x-5$ **f** $7x^2+25x-12$ **g** $8x^2-22x+15$ **h** $12x^2+17x-5$

Section B

Fully factorise each of these quadratics.

a $16x^2-25$ **b** $4x^2-16x$ **c** $x^2+13x+12$ **d** $3x^2+16x-35$

e x^2+x-12 **f** $100-9x^2$ **g** $2x^2-14x$ **h** $20x^2-3x-2$

Section C

Write each of these quadratic expressions in the form $p(x+q)^2+r$

a x^2+8x **b** x^2-18x **c** x^2+6x+3 **d** $x^2+12x-5$

Section D

Use completing the square to find the turning point of each of these curves and state whether it is a maximum or a minimum.

a $y=x^2+14x$ **b** $y=x^2-18x+3$ **c** $y=x^2-9x$ **d** $y=-x^2+4x$

Sketching Quadratics

Example 1 Link

Write $2x^2 - 10x + 3$ in the form $p(x + q)^2 + r$

$= 2\left[x^2 - 5x\right] + 3$

$= 2\left[\left(x - \frac{5}{2}\right)^2 - \frac{25}{4}\right] + 3$

$= 2\left(x - \frac{5}{2}\right)^2 - \frac{25}{2} + 3$

$= 2\left(x - \frac{5}{2}\right)^2 - \frac{25}{2} + \frac{6}{2}$

$= 2\left(x - \frac{5}{2}\right)^2 - \frac{19}{2}$

Example 2 Link

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

① y-intercept

$x = 0, \quad y = -(0)^2 + 4(0)$

$y = 0$

② Roots

$-x^2 + 4x = 0$

$x^2 - 4x = 0$

$x(x - 4) = 0$

$x = 0$ or $x = 4$

③ Turning point

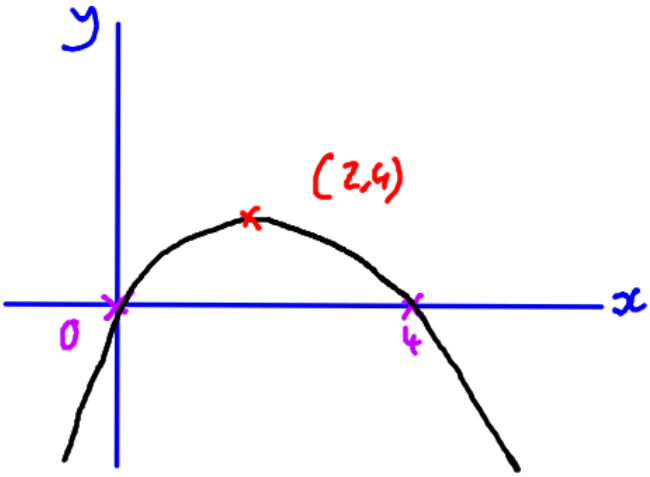
$-x^2 + 4x$

$= -\left[x^2 - 4x\right]$

$= -\left[(x - 2)^2 - 4\right]$

$= -(x - 2)^2 + 4$

$(2, 4)$



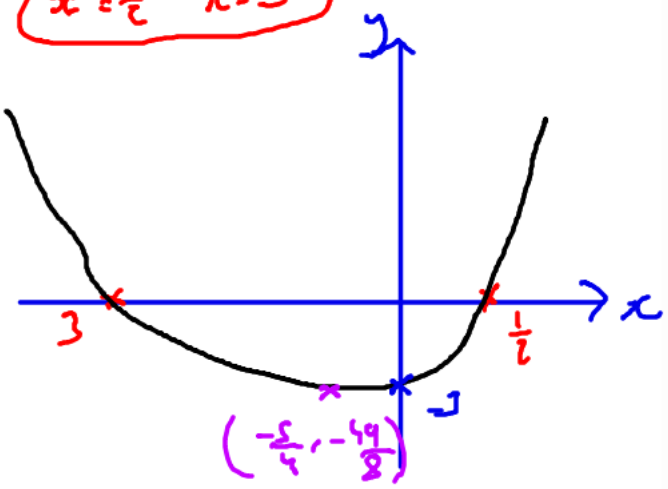
Example 3 Link

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

① y-intercept
$x = 0$, $y = -3$

② Roots
$2x^2 + 5x - 3 = 0$
$(2x - 1)(x + 3) = 0$
$x = \frac{1}{2}$ $x = -3$

③ Turning point
$y = 2x^2 + 5x - 3$
$= 2\left[x^2 + \frac{5}{2}x\right] - 3$
$= 2\left[\left(x + \frac{5}{4}\right)^2 - \frac{25}{16}\right] - 3$
$= 2\left(x + \frac{5}{4}\right)^2 - \frac{25}{8} - \frac{24}{8}$
$= 2\left(x + \frac{5}{4}\right)^2 - \frac{49}{8}$
$\left(-\frac{5}{4}, -\frac{49}{8}\right)$



Exercise 1

(1) Sketch the following quadratics, labelling any intercepts and the turning point

(a) $y = x^2 - 2x - 8$

(b) $y = x^2 + 8x + 15$

(c) $y = x^2 - 5x - 6$

(2) Sketch the following quadratics, labelling any intercepts and the turning point

(a) $y = -x^2 - 10x$

(b) $y = -x^2 + 2x + 3$

(c) $y = -x^2 + x + 72$

(3) Sketch the following quadratics, labelling any intercepts and the turning point

(a) $y = 3x^2 + x + 3$

(b) $y = 2x^2 - 7x + 6$

(c) $y = -6x^2 + x + 2$