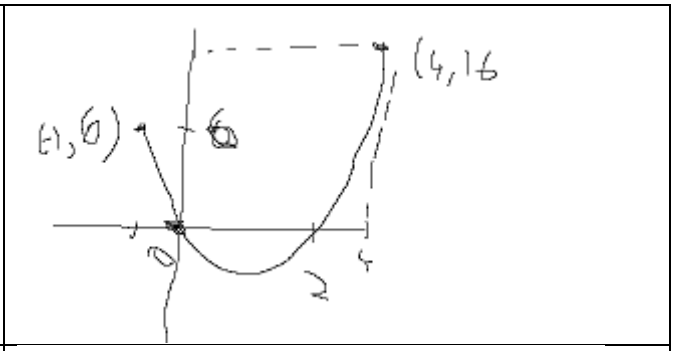
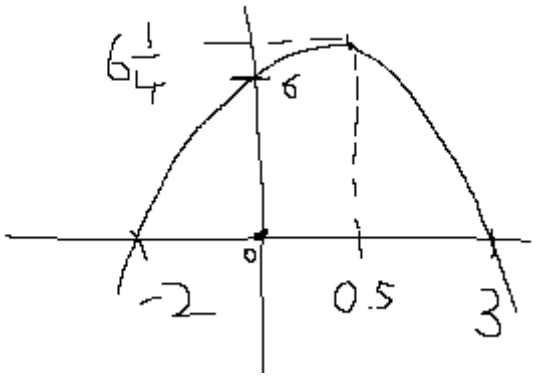
Quadratic Curves

1. Objective

- Learn to draw quadratic curves

2. Form $y = a(x-b)(x-c)$

1	$y = 2x(x-2)\ for -1 \le x \le 4$ $Find\ y = 0$ $2x(x-2) = 0$ $x = 0, \quad x = 2$ $Find\ the\ range$ $f(-1) \rightarrow y = 2(-1)(-1-2)$ $y = -2(-3) = 6$ $f(4) \rightarrow y = 2(4)(4-2)$ $y = 8(2) = 16$	
2	$y = (x+2)(3-x)$ $Find\ y = 0$ $2x(x-2) = 0$ $x = -2, \quad x = 3$ $Find\ x = 0$ $y = 6$ $Find\ midpoint$ $x = \frac{-2+3}{2} = \frac{1}{2}$ $y = \left(\frac{1}{2}+2\right)\left(3-\frac{1}{2}\right) = 6\frac{1}{4}$	

3. Form $y = a(x-h)^2 + k$

- Rewrite $ax^2 + bx + c\ to\ a(x-h)^2 + k$
- By using completing square

4. Exercise rewrite

1	$x^2 - 4x + 5 = x^2 - 4x + (-2)^2 = -5 + (-2)^2$ $= (x-2)^2 + 1$
2	$5x^2 + 3x - 2 = x^2 + \frac{3}{5}x + \left(\frac{3}{5}\right)^2 = \frac{2}{5} + \left(\frac{9}{25}\right)$ $= \left(x + \frac{3}{5}\right)^2 + \frac{19}{25}$
3	$(2x-1)^2 - 2 = 2^2\left(x - \frac{1}{2}\right)^2 - 2 = 4\left(x - \frac{1}{2}\right)^2 - 2$

5. Observations $y = a(x - h)^2 + k$

$$a > 0, \qquad U\ Shaped$$

- $Turning\ point \rightarrow (h, k)$
- $Minimum\ value = k$
    - $at\ corresponding\ x\ value\ of\ h$

$$a < 0, \qquad N\ Shaped$$

- $Turning\ point \rightarrow (h, k)$
- $Maximum\ value = k$
    - $at\ corresponding\ x\ value\ of\ h$

6. Exercise $y = a(x - h)^2 + k$

1	$y = 2x(x - 2)$ $2x^2 - 4x = x^2 - 2x + (-1)^2 - (-1)^2$ $(x - 1)^2 - 2$	
2	$2x^2 - 4x + 7 = 0$ $2\left(x^2 - 2x + (-1)^2 + \frac{7}{2} - (-1)^2\right)$ $2((x - 1)^2 + \frac{5}{2})$ $2(x - 1)^2 + 5$