



Quadratics Exercises sheet

Exercise 1: In the list of functions below, which ones represent quadratic functions ?

a) $f(x) = -3(x-1)(x+3)$

b) $f(t) = (t+2)^2 - (t-2)^2$

c) $f(a) = (3a+1)(a-2) - 3a^2 + a - 1$

d) $f(x) = (x+1)^3 - (x-1)^3$

e) $f(x) = \frac{x^4 - 4}{x^2 + 2}$

f) $f(x) = \frac{x^3 - 2x^2}{x}$

Exercise 2: Below are 16 second degree equations:

1) $2x^2 + 5x = 0$

2) $4a^2 - 81 = 0$

3) $x^2 - 4x - 5 = 0$

4) $(x-9)^2 + 89 = 0$

5) $x^2 + x - 1 = 0$

6) $u^2 - 25 + 3(u+5) = 0$

7) $t^2 - 10t - 24 = 0$

8) $x^2 + 4 = 0$

9) $(a+5)^2 - 4a - 20 = 0$

10) $u^2 + 16u + 63 = 0$

11) $2x^2 - 49x = 0$

12) $(3y-7)^2 - 4(y+1)^2 = 0$

13) $x^2 - 11x + 28 = 0$

14) $x^2 - 3 = 0$

15) $-\frac{1}{2}x^2 - \frac{11}{3}x - \frac{7}{6} = 0$

16) $\frac{1}{5}x^2 - 3x + \frac{2}{5}$

1. From this list, select 2 equations for which it is obvious that they don't have solutions.
2. From this list, select 7 equations which are very easy to factorise. Factorise them and then solve them.
3. Solve the 7 equations that are left over, using the discriminant.

Exercise 3: Factorise each of the expressions below.

1) $-3x^2 - 11x - 8$

2) $9x^2 + 6x + 1$

3) $2x^2 - 9x - 5$

4) $3x^2 + 2x$

5) $7x^2 - 12x + 5$

6) $-4x^2 + 3x + 1$

7) $\frac{1}{2}x^2 - \frac{5}{3}x - 12$

8) $\frac{x^2 + x - 1}{3}$

9) $x^2 - 4x + 1$

Exercise 4: Analyse the sign of the following trinomials as x varies:

1) $f(x) = x^2 - 5x + 6$

2) $f(x) = 7x^2 - 12x + 5$

3) $f(x) = -3x^2 + 5x - 2$

4) $f(x) = 3x^2 + 8x - 11$

5) $f(x) = x^2 - x + 1$

6) $f(x) = -x^2 + 6x - 9$

Exercise 5: Solve the following inequalities in \mathbb{R} :

1) $x^2 - 9 \geq 0$

2) $3x^2 - 11x + 8 \leq 0$

3) $-x^2 - 4x + 5 > 0$

4) $-4x^2 - 19x + 5 < 0$

5) $(2x-3)(-2x^2+5x+3) > 0$

6) $(1-4x)(x^2+x+1) \leq 0$

7) $\frac{x^2 - 4x + 3}{x^2 + 6x} \leq 0$

Exercise 6:

1. Develop the expression $a \left[\left(x + \frac{b}{2a} \right)^2 - \frac{\Delta}{4a^2} \right]$. What expression do you find ?
2. When is it possible to factorise this expression ?
3. What are the roots then ?
4. What happens when $\Delta = 0$?
5. And when $\Delta < 0$?