Quadratic Theory

1. Solve the following quadratic inequalities:

   (a) $25 - x^2 \leq 0$ (b) $4 + 5x + x^2 > 0$ (c) $4x^2 - 24x + 35 < 0$

2. Solve the following quadratic equations, by first writing in the form $a(x+b)^2 + c$:

   (a) $x^2 + 4x + 3 = 0$ (b) $x^2 + 6x + 1 = 0$ (c) $2x^2 - 5x - 33 = 0$

3. An equation is given as $tx + 3t + \frac{t+5}{x} = 0$ where $x \neq 0$ and $t \neq 0$.

   (a) Show clearly that this equation can be written in the form

   $$tx^2 + 3tx + t + 5 = 0 .$$

   (b) Hence find the values of t which would result in the above equation having **real roots**.

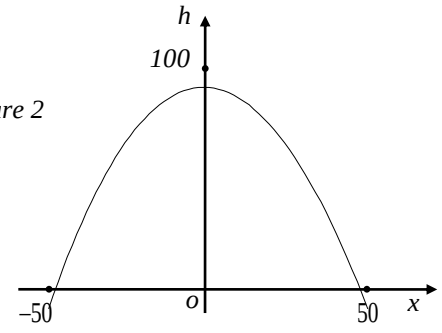
4. Find the values of p for which the quadratics equation in x, $x^2 - 2x + 21 = 2p(3x - 7)$ have equal roots

5. For what values of t does the equation $x^2 + (t-1)x = 2t + 1$ have no real roots ?

6. The famous Gateway Arch in the United States is parabolic in shape.
   Figure 2 shows a rough sketch of the arch relative to a set of rectangular axes.

Figure 1

Figure 2



From *figure 2* establish the equation connecting h and x.

7. Show that the line with equation $4x - y - 1 = 0$ is a tangent to the parabola with equation $y = x^2 + 6x$

8. Find the equations of the tangents to the parabola $y = x^2 + 9$ at the point (0, 8)