1) $x^2 - 6x + 11$

$(x - 3)^2 - 9 + 11$

$(x - 3)^2 + 2$

Minimum point is $(3, 2)$ $\therefore$ $x^2 - 6x + 11 > 0$ for all values of x.

2) $x^2 + 4x + 12 > x + 3$

$x^2 + 3x + 9 > 0$

$\left(x + \frac{3}{2}\right)^2 - \frac{9}{4} + 9 > 0$

$\left(x + \frac{3}{2}\right)^2 + \frac{27}{4} > 0$

Min point at $\left(-\frac{3}{2}, \frac{27}{4}\right)$

$\therefore$ $x^2 + 4x + 12 > x + 3$ for all values of x

3a)

$$x^2 + px + 4 = 0$$

$$\left(x + \frac{p}{2}\right)^2 - \frac{p^2}{4} + 4 = 0$$

$$\left(x + \frac{p}{2}\right)^2 = \frac{p^2}{4} - 4$$

$$\left(x + \frac{p}{2}\right) = \pm\sqrt{\frac{p^2}{4} - 4}$$

$$x = -\frac{p}{2} \pm \sqrt{\frac{p^2}{4} - 4}$$

b) The equation has no real roots when:

$$\frac{p^2}{4} - 4 < 0$$

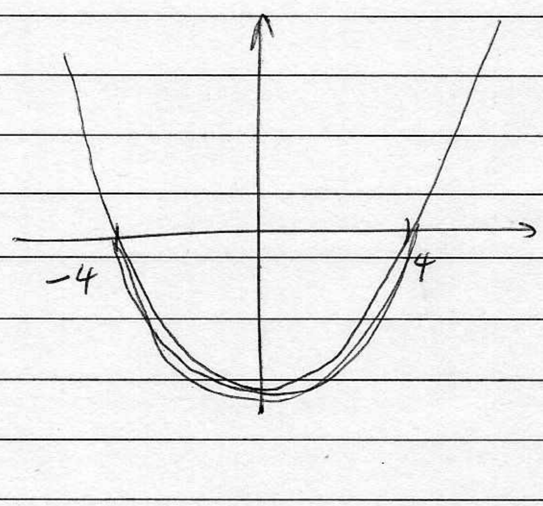
$$\frac{p^2}{4} < 4$$

$$p^2 < 16$$

$$p^2 - 16 < 0$$

$$(p + 4)(p - 4) < 0$$

$p = -4 \quad p = 4$



$$\underline{-4 < p < 4}$$

4/ $(x-4)^2 - 3$

$(x-4)(x-4) - 3$

$x^2 - 4x - 4x + 16 - 3$

$\underline{\underline{x^2 - 8x + 13}}$

$\underline{\underline{a = -8}}$ $\underline{\underline{b = 13}}$

5/ $2x^2 + 8x + 1$

$2\left(x^2 + 4x + \frac{1}{2}\right)$

$2\left((x+2)^2 - 4 + \frac{1}{2}\right)$

$2\left((x+2)^2 - \frac{7}{2}\right)$

$\underline{\underline{2(x+2)^2 - 7}}$

$\underline{\underline{a = 2}}$ $\underline{\underline{b = 2}}$ $\underline{\underline{c = -7}}$

6/a/ $x^2 + 9x + 3$

$\left(x + \frac{9}{2}\right)^2 - \frac{81}{4} + 3$

$\left(x + \frac{9}{2}\right)^2 - \frac{69}{4}$

b/ $\left(-\frac{9}{2}, -\frac{69}{4}\right)$

7) a)

$$x^2 + kx - 6 = 0$$

$$\left(x + \frac{k}{2}\right)^2 - \frac{k^2}{4} - 6 = 0$$

$$\left(x + \frac{k}{2}\right)^2 = \frac{k^2}{4} + 6$$

$$x + \frac{k}{2} = \pm\sqrt{\frac{k^2}{4} + 6}$$

$$x = \frac{-k}{2} \pm \sqrt{\frac{k^2}{4} + 6}$$

b) $k = 4$

$$x = \frac{-4}{2} \pm \sqrt{\frac{(4)^2}{4} + 6}$$

$$= -2 \pm \sqrt{10}$$

$x = -2 + \sqrt{10}$ or $x = -2 - \sqrt{10}$