5. Solve for x:

$$(x+1)(x+2)(x+3)(x+4) = 120$$

Solution.

$$(x+1)(x+2)(x+3)(x+4) = 120$$
$$\{(x+1)(x+4)\}\{(x+2)(x+3)\} = 120$$
$$\{(x^2+5x+4)\}\{(x^2+5x+6)\} = 120$$

Put $x^2 + 5x = a$

$$(a+4)(a+6) = 120$$
$$a^2 + 10a - 96 = 0$$
$$(a+16)(a-6) = 0$$
$$a = 6, -16$$
$$x^2 + 5x = 6, -16$$
$$x^2 + 5x - 6 = 0,\ x^2 + 5x + 16 - 0$$
$$(x+6)(x-1) = 0,\ x^2 + 5x + 16 - 0$$
$$x = 1, -6, \frac{-5 \pm i\sqrt{39}}{2}$$

Hence, the solutions are

$$\left\{1, -6, \frac{-5 \pm i\sqrt{39}}{2}\right\}$$

6. If a, b, c are three real numbers , then find the roots of the equation

$$\frac{(x-b)(x-c)}{(a-b)(a-c)}a^2+\frac{(x-a)(x-c)}{(b-a)(b-c)}b^2+\frac{(x-b)(x-a)}{(c-b)(c-a)}c^2-x^2=0$$

It is true for all real values of x.
So it is an identity in x
Thus the number of real solution is infinite.