1. Find the values of p for which $px^2 = 2x - p$, where $p \neq 0$, has equal real roots

   若方程式 $px^2 = 2x - p$ 有等根, 且 $p \neq 0$, 求 p 值

$$p = \pm 1$$

2. The quadratic equation $x^2 + 2kx + (k-1)(k-3) = 0$ has no real roots. Find the range of values of k

   若一元二次方程式 $x^2 + 2kx + (k-1)(k-3) = 0$ 没有实根，求 k 的范围

$$k < \frac{3}{4}$$

3. Given one of the roots of the quadratic equation $3x^2 + 10x + k = 0$ is -1, find the value of k

   已知一元二次 $3x^2 + 10x + k = 0$ 的其中一个根是 -1, 求 k 值

$$k = 7$$

4. Given that one of the roots of the quadratic equation $ax^2 + 9x + 2a = 0 \ (a \neq 0)$ is -4, find the other root and the value of a

   已知一元二次方程式 $ax^2 + 9x + 2a = 0 \ (a \neq 0)$ 的其中一根是 -4, 求另一个根和 a 值

$$-\frac{1}{2}, a = 2$$

5. Given that α and β are the roots of the equation $2x^2 + 7x - 4 = 0$ and $\alpha > \beta$, find
   a. $\alpha^2 + \beta^2$
   b. $\alpha^3 + \beta^3$
   c. $\frac{1}{\alpha} + \frac{1}{\beta}$
   d. $\alpha - \beta$

   已知 α 和 β 是一元二次 $2x^2 + 7x - 4 = 0$ 的根，且 $\alpha > \beta$, 求

   a. $\alpha^2 + \beta^2$

   b. $\alpha^3 + \beta^3$

   c. $\frac{1}{\alpha} + \frac{1}{\beta}$

   d. $\alpha - \beta$

$$a.\frac{64}{5}, b.-\frac{511}{8}, c.\frac{7}{4}, d.\frac{9}{2}$$

6. Given one of the roots of the equation $2x^2 - 9x - (2k - 3) = 0$ is twice the other root. Find the value of k and the roots of the equation

   已知一元二次 $2x^2 - 9x - (2k - 3) = 0$ 的其中一根是另一根的两倍，求 k 和根

$$k = -3, \frac{3}{2}, 3$$

7. If α and β are the two roots of the equation $3x^2 + 4x - 5 = 0$, form the equation with the roots $\frac{1}{\alpha}$ and $\frac{1}{\beta}$

   若 α 和 β 是方程式 $3x^2 + 4x - 5 = 0$ 的两根，求方程式若根为 $\frac{1}{\alpha}$ 和 $\frac{1}{\beta}$

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

8. Find the values of m if the straight line $y = m(x - 3)$ is a tangent to the curve $y = x^2 - 3x + 1$

   求 m 值若直线方程 $y = m(x - 3)$ 是曲线 $y = x^2 - 3x + 1$ 的切线

$$m = 5, m = 1$$

9. Show that the equation $2x^2 - 4x = 2x - 3 + px^2$ has real roots if $p \geq -1$

   试证明 $2x^2 - 4x = 2x - 3 + px^2$ 有实根若 $p \geq -1$

10. Show that equation $(m + 3)x^2 - (m^2 - 8)x + (m - 3) = 0$ has real root, for any real number of m and $m \neq -3$

    试证明方程式 $(m + 3)x^2 - (m^2 - 8)x + (m - 3) = 0$ 具有真实根数，对于任何实数 m，且 $m \neq -3$

11. Form the equation with α, β as the positive roots of the equation, $\alpha^2 + \beta^2 = \frac{25}{36}, (1 - \alpha)(1 - \beta) = \frac{1}{6}$

    以 α, β 形成一根方程式，若 α, β 是方程式 $\alpha^2 + \beta^2 = \frac{25}{36}, (1 - \alpha)(1 - \beta) = \frac{1}{6}$ 的正实数根
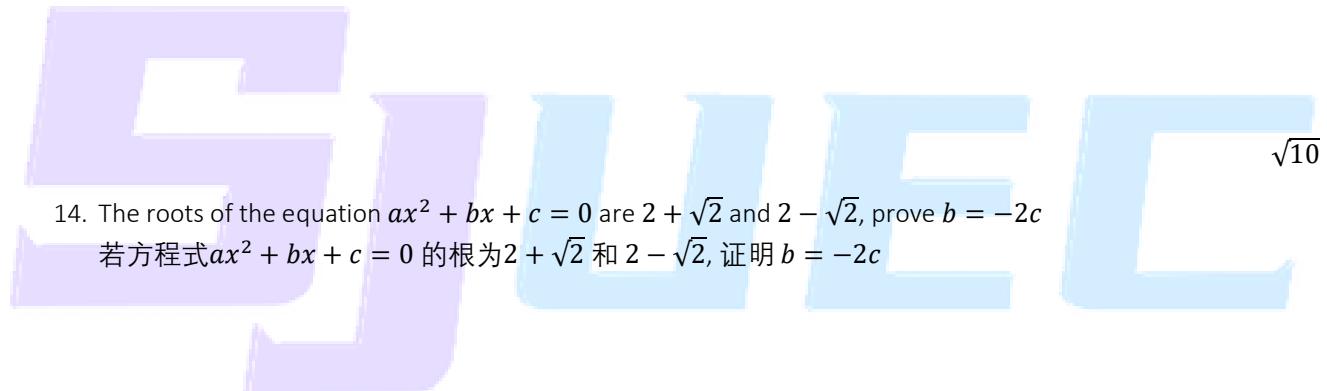
$$6x^2 - 7x + 2 = 0$$

12. Given that α is a root of the equation $x^2 = x + 9$, prove that $\alpha^3 = 10\alpha + 9$

    已知α 是方程式$x^2 = x + 9$的根, 试证明 $\alpha^3 = 10\alpha + 9$

13. Given that α, β are roots of the equation $x^2 - 6x + 4 = 0$, find the value of $\sqrt{\alpha} + \sqrt{\beta}$

    已知α, β 是方程式$x^2 - 6x + 4 = 0$的根, 求$\sqrt{\alpha} + \sqrt{\beta}$的值

$\sqrt{10}$

14. The roots of the equation $ax^2 + bx + c = 0$ are $2 + \sqrt{2}$ and $2 - \sqrt{2}$, prove $b = -2c$

    若方程式$ax^2 + bx + c = 0$ 的根为$2 + \sqrt{2}$ 和 $2 - \sqrt{2}$, 证明 $b = -2c$

15. If the equation $3x^2 + mx + 1 = 0$ and $2x^2 + nx + 1 = 0$ has one common root, prove that $2m^2 + 3n^2 - 5mn + 1 = 0$

    若方程式$3x^2 + mx + 1 = 0$ 和$2x^2 + nx + 1 = 0$ 有公共根, 证明$2m^2 + 3n^2 - 5mn + 1 = 0$

16. Find the minimum point
    a. $f(x) = 2x^2 + 8x$
    b. $f(x) = 3x^2 - 18x - 5$

求极小值
    c. $f(x) = 2x^2 + 8x$
    d. $f(x) = 3x^2 - 18x - 5$

$$a.\,(-2, -8), b.\,(3, -32)$$

17. Given that $f(x) = x^2 - 8x + 6 = (x + p)^2 + q$, find the values of p,q, the minimum point of $f(x)$ and state the equation of the axis of symmetry

已知$f(x) = x^2 - 8x + 6 = (x + p)^2 + q$, f 求 p,q, 方程式极小值 $f(x)$ 和对称轴方程式

$$(4, -10), x = 4$$

18. Given that the extreme value of $y = ax^2 + 4ax + 1$ is 5, find the value of a

若方程式 $y = ax^2 + 4ax + 1$ 的极值是 5, 求 a 值

$$a = -1$$