

$$-4\alpha - 8\alpha^2 + 2\alpha^2 + 4\alpha = \alpha^2(-\alpha^2 - 2\alpha)$$

$$\Rightarrow \alpha^3 + 2\alpha^2 - 6\alpha = 0, \alpha \neq 0$$

$$\alpha^2 + 2\alpha - 6 = 0$$

$$\alpha_{1,2} = -1 \pm \sqrt{7}$$

$$-4\alpha - 2\beta = \alpha^2 \beta \rightarrow \text{(Let's solve the values of the equation)}$$

$$\alpha_1 = -1 - \sqrt{7} \text{ for } \beta_1 = \frac{4(1+\sqrt{7})}{10+2\sqrt{7}}$$

$$\alpha_2 = -1 + \sqrt{7} \text{ for } \beta_2 = \frac{4(1-\sqrt{7})}{10-2\sqrt{7}}$$

$$\alpha_{1,2} \text{ and } \beta_{1,2} \text{ for } a = \frac{10 \mp 7\sqrt{7}}{54}$$

$$\left(\frac{10-7\sqrt{7}}{54}\right)x^3 - x^2 - x + 2 = (x+1+\sqrt{7})^2 \left(x - \frac{4(1+\sqrt{7})}{10+2\sqrt{7}}\right)$$

$$\left(\frac{10+7\sqrt{7}}{54}\right)x^3 - x^2 - x + 2 = (x+1-\sqrt{7})^2 \left(x - \frac{4(1-\sqrt{7})}{10-2\sqrt{7}}\right)$$