Of the three roots of the cubic equation $x^3 - 15x + 4 = 0$, two are reciprocals.

1. Find the other root.

2. Find all the roots and verify that two of them are recipricols.

The cubic polynomial equation $x^3 = ax^2 + bx + c$ has three real roots, two of which are opposites. Prove that

3. One of the roots is a.

4. The other roots are \sqrt{b} and $-\sqrt{b}$.

5. ab + c = 0.

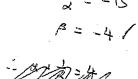
$$f(x) = x^4 + 4x^3 + 8x - 4$$

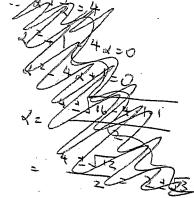
- 6. Show that f(x) has a zero, α , between 0 and 1.
- 7. Determine whether α lies closer to 0 or to 1.
- 8. Taking 0.5 as a first approximation, use Newton's method to find a two-placed decimal approximation to α .

9. Show by division, or otherwise, that $(x^2 + 2)$ is a factor of f(x).

10. Show that f(x) has only two real roots and find the value of α correct to three decimal places.

1. $\chi^3 = 15\chi + 4 = 0$ Let the roots be $\alpha, \frac{1}{\alpha}$, β $\alpha + \frac{1}{\alpha} + \beta = 0$ $1 + \alpha\beta + \frac{\beta}{\alpha} = -15$





2.
$$6\pi 1 - 4d = -\frac{4}{d} = -15$$

$$d - 4a^{2} - 4 = -15a$$

$$4a^{2} - 16a + 4 = 0$$

$$x^{2} - 4a + 1 = 0$$

$$d = \frac{42\sqrt{16-4-1-1}}{2} = \frac{42\sqrt{12}}{2}$$

$$= 22\sqrt{3}$$

One of the root is $2+\sqrt{3}$ other root: $\frac{1}{2+\sqrt{3}}$ $\frac{2+\sqrt{3}}{2-\sqrt{3}}$ $\frac{2-\sqrt{3}}{4-3} = 2-\sqrt{3}$

3.
$$x^3 - ax^2 - bx - c = 0$$

Let the note be $x, -\alpha, \beta$
 $x^2 - \alpha + \beta = \alpha$
 $x^2 - \alpha + \beta = \alpha$

4.
$$-\lambda^{2} + \alpha\beta - \alpha\beta = \frac{1}{2} - \frac{1}{2}$$

$$-\lambda^{2} = \frac{1}{2} - \frac{1}{2}$$

$$\lambda^{2} = \frac{1}{2}$$

$$\lambda = \pm \frac{1}{2}$$

$$5. - \alpha^{2}\beta = \xi$$

$$-b^{*}\alpha = \zeta$$

$$-ab = \zeta$$

$$ab + \zeta = 0$$

5.
$$f(0) = -4$$
 $f(0) = 9$
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$$\int |x(x)|^{2} = x^{4} + 4x^{3} + 8x^{-4}$$

$$\int |(0.5)|^{2} = 0.5625$$

$$\int |(x)|^{2} = 4x^{3} + 12x^{2} + 8x$$

$$= 11.5$$

$$z_2 = 0.5 - \frac{f(0.5)}{f(0.5)}$$

$$= 0.45$$

$$3(^{2}+3)(x)^{4}+4x+3x-4$$

$$-34+3x+3x-4$$

$$-3x^{2}+3x+3x-4$$

$$-3x^{2}-3x^{2}4$$

$$|0b|$$
, $z = -b + \int b^2 - iac$

$$= -4 + \int m 8$$

$$= -3.41$$

(10)(b) For
$$f(x) = (x^2+2)(x^2+4x-2)=0$$

$$x = -4 \pm \sqrt{16+6}$$

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