

From Assignment 120

58. Given: $f(x) = 25x^3 - 55x^2 - 54x - 18$ with a zero of: $\frac{1}{5}(-2 + \sqrt{2}i)$.

Find all of the zeros.

Solution:

$\frac{1}{5}(-2 - \sqrt{2}i)$ is also a zero. So we make factors by subtraction of these zeros from x . When we multiply these factors the result must also be a factor of $f(x)$.

$$\left(\left[x + \frac{2}{5} \right] - \frac{\sqrt{2}}{5}i \right) \left(\left[x + \frac{2}{5} \right] + \frac{\sqrt{2}}{5}i \right) = x^2 + \frac{4}{5}x + \frac{4}{25} + \frac{2}{25} = x^2 + \frac{4}{5}x + \frac{6}{25}$$

Divide this into the original $f(x)$.

$$\begin{array}{r} x^2 + \frac{4}{5}x + \frac{6}{25} \quad) \quad \begin{array}{r} 25x^3 \quad -55x^2 \quad -54x \quad -18 \\ \underline{25x^3 \quad 20x^2 \quad 6x} \\ -75x^2 \quad -60x \quad -18 \\ \underline{-75x^2 \quad -60x \quad -18} \\ \\ 0 \end{array} \end{array}$$

$$f(x) = (25x - 75) \left(x^2 + \frac{4}{5}x + \frac{6}{25} \right) = 25(x - 3) \left(x + \frac{2}{5} - \frac{\sqrt{2}}{5}i \right) \left(x + \frac{2}{5} + \frac{\sqrt{2}}{5}i \right)$$

Zeros are: $\boxed{3, \frac{1}{5}(-2 + \sqrt{2}i), \frac{1}{5}(-2 - \sqrt{2}i)}$.