Hon Pre-Calc

Quiz - Solve Polynomial Name [redacted]

Show all work!!! Circle ALL final answers!!!

Short Answer

1. Given: $f(x) = 2x^7 - 13x^6 + 50x^5 - 118x^4 + 126x^3 - 35x^2 - 22x + 10$, and $f(1+3i) = 0$

   a) Determine the number(s) of positive, negative, and imaginary zeros

Positive	Negative	Imaginary
6	1	0
4	1	2
2	1	4
0	1	6

   b) List all possible rational zeros

Possible Rational Zeros $= \pm\{1, 2, 5, 10, \frac{1}{2}, \frac{5}{2}$

Zeros: $1 \pm 3i$, $\frac{1}{2}$, 1 mult 2, $1 \pm \sqrt{2}$

   c) Solve completely

$= (x-(1+3i))(x-(1-3i))$

$= (x-1-3i)(x-1+3i)$

$= (x-1)^2 - 9i^2$

$= x^2 - 2x + 1 + 9$

$= x^2 - 2x + 10$

$2x^5 - 9x^4 + 12x^3 + 4x^2 - 2x + 1$

$x^2-2x+10 \;\overline{)\; 2x^7 - 13x^6 + 50x^5 - 118x^4 + 126x^3 - 35x^2 - 22x + 10}$

$-2x^7 + 4x^6 + 20x^5$

$-9x^6 + 30x^5 - 118x^4$

$+9x^6 - 18x^5 + 90x^4$

$12x^5 - 28x^4 + 126x^3$

$-12x^5 + 24x^4 + 120x^3$

$-4x^4 + 6x^3 - 35x^2$

$+4x^4 - 8x^3 + 40x^2$

$-2x^3 + 5x^2 - 22x$

$+2x^3 - 4x^2 + 20x$

$x^2 - 2x + 10$

$-x^2 + 2x - 10$

0

$(x^2-2x+10)(2x^5 - 9x^4 + 12x^3 - 4x^2 - 2x + 1)$

$\frac{1}{2} \mid 2 \;\; -9 \;\; 12 \;\; -4 \;\; -2 \;\; 1$

$\downarrow \;\; 1 \;\; -4 \;\; 4 \;\; 0 \;\; -1$

$2 \mid 2 \;\; -8 \;\; 8 \;\; 0 \;\; -2 \;\; 0$

$\downarrow \;\; 4 \;\; -8 \;\; 0 \;\; 0$

$2 \;\; -4 \;\; 0 \;\; 0$

$\rightarrow$

$-2 \mid 2 \;\; -8 \;\; 8 \;\; 0 \;\; -2$

$\downarrow \;\; -4 \;\; 24 \;\; -64$

$2 \;\; -12 \;\; 32 \;\; -64$

Continue on back

$$\begin{array}{c|ccccc} 1 & 2 & -8 & 8 & 0 & -2 \\ & \downarrow & 2 & -6 & 2 & 2 \\ \hline & 2 & -6 & 2 & 2 & 0 \end{array}$$

$$\begin{array}{c|ccccc} 1 & 2 & -6 & 2 & 2 & 0 \\ & \downarrow & 2 & -4 & -2 & \\ \hline & 2 & -4 & -2 & 0 & \end{array}$$

$2x^2 - 4x - 2$

$2(x^2 - 2x - 1)$

$x = \frac{2 \pm \sqrt{(-2)^2 - 4(1)(-1)}}{2}$

$x = \frac{2 \pm \sqrt{8}}{2}$

$x = \frac{2 \pm 2\sqrt{2}}{2}$

$x = 1 \pm \sqrt{2}$

Zeros: $1 \pm \sqrt{2}$, $1 \pm 3i$, $\frac{1}{2}$, 1 mult 2

4 positive: $\frac{1}{2}$, 1, 1, $1+\sqrt{2}$ (1 and 1: multiplicity of 2)

1 Negative: $1-\sqrt{2}$

2 Imaginary: $1+3i$, $1-3i$