# 2.5 Hints

#'s 21, 22, 25, 26, Graph to determine how many real zeros & how many imaginary.

(33) $1+i$ is a zero of $f(x) = x^4 - 2x^3 - x^2 + 6x - 6$

$1-i$ is also a zero

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

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

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

$x^2 - 2x + 1 + 1$

$x^2 - 2x + 2$ ← this quad. has zeros of $1+i$ & $1-i$

now divide $(x^4 - 2x^3 - x^2 + 6x - 6) \div (x^2 - 2x + 2)$, you should get a remainder of zero

$$
\begin{array}{r|l}
 & x^2 - 3 \\
x^2 - 2x + 2 & x^4 - 2x^3 - x^2 + 6x - 6 \\
 & -x^4 + 2x^3 \mp 2x^2 \\
\hline
 & -3x^2 + 6x - 6 \\
 & +3x^2 + 6x + 6 \\
\hline
 & 0
\end{array}
$$

0 ← we got a remainder of zero! ☺

Therefore,
$(x^4 - 2x^3 - x^2 + 6x - 6) = (x^2 - 2x + 2)(x^2 - 3)$

↑ we already know this has zeros of $1+i$ & $1-i$

↑ find these zeros
$x^2 - 3 = 0$
$x^2 = 3$
$x = \pm\sqrt{3}$

$\boxed{\text{zeros: } 1+i,\ 1-i,\ \sqrt{3},\ -\sqrt{3}}$