

1.(5 pts) Form a polynomial in factored form with *real* coefficients with the given zeros and degree. Please do not expand the polynomial.

Zeros: 1, multiplicity 2; -3, multiplicity 2. Degree 4.

2. (10 pts) Expand $(x + (2 - 7i))(x + (2 + 7i))$

3. (5 pts) Use synthetic division to find $P(2)$ if $P(x) = 3x^5 - 2x^3 + 2x^2 - 7x + 5$.

4. (5 pts) Divide $f(x) = x^4 - 3x^3 + 2x^2 + 5$ by $d(x) = x^2 - 2$. Then write the result in the form $Dividend = Divisor \cdot Quotient + Remainder$.

6. Use your sketch from the previous problem to help you solve the following inequalities. You might want to re-sketch it, below, just to have it on the same page.

a. (5 pts) $3(x-2)^2(x+1)(x-1)^2 > 0$

b. (5 pts) $\frac{3(x-2)^2}{(x+1)(x-1)^2} \geq 0$ (A very different-looking function, but not so very different, when it comes to solving inequalities).

7. (5 pts) Show that $x = 5$ is an upper bound on real zeros for $f(x) = x^4 - 5x^3 + 15x^2 - 5x - 26$.

8. (10 pts) Find the *real* zeros of $f(x) = x^4 - 5x^3 + 15x^2 - 5x - 26$. Factor f over the set of real numbers. Use scratch paper (the back of page 5) to make your guesses, and then use the *correct* guesses to break f down in the space, below.

9. (5 pts) Find the remaining (nonreal) zeros of f and factor f over the set of *complex* numbers.

10. (10 pts) Suppose $R(x) = \frac{x^3 - 8x^2 + x + 42}{x^3 - x^2 - 10x - 8}$ can be factored into $\frac{(x-3)(x+2)(x-7)}{(x+2)(x-4)(x+1)}$.

(It can.) Sketch the graph of R showing all intercepts, asymptotes and holes (if any).