

1. (10 pts) Form a polynomial of *minimal degree* in *factored form* that has real coefficients (after expanding) and will have the given zeros. Do *not* expand your polynomial. Leave it factored! If you run out of room, you're doing it wrong!

Zeros: $x = 3$, multiplicity 2; $x = 3 - 7i$, multiplicity 1; $x = -5$, multiplicity 2.

2. (10 pts) Use synthetic division to find $P(-2)$ if $P(x) = 3x^5 - 7x^4 + x^2 - 10x - 5$.

3. (5 pts) Represent the work you just did on the previous problem by writing $P(x)$ in the form $Dividend = Divisor \bullet Quotient + Remainder$.

4. Suppose $f(x) = (x-1)(x+2)^2(x-4) = x^4 - x^3 - 12x^2 - 4x + 16$.

- a. (5 pts) Provide a rough sketch of f , using its zeros, their respective multiplicities and the end behavior of f . Include x - and y -intercepts. Your graph should be smooth. Un-exaggerate the vertical for a better quality graph.

- b. Solve the inequalities (You've done the work. Now, INTERPRET.):

i) (5 pts) $(x-1)(x+2)^2(x-4) \leq 0$

ii) (5 pts) $\frac{(x+2)^2}{(x-1)(x-4)} \geq 0$

5. (10 pts) Find the *real* zeros of $f(x) = 2x^4 - 4x^3 + 3x^2 - x - 10$. Then factor f over the set of **real numbers**. This should involve an irreducible quadratic factor.

6. (5 pts) Find the remaining (nonreal) zeros of f and factor f over the set of **complex numbers**. (Some/most of this work may be done, above. If you're clear where it kicks in, I'll see it.)

7. (10 pts) Sketch the graph of $R(x) = \frac{x^2 - 3x - 10}{x^2 - x - 6}$, showing all asymptotes, intercepts, and any holes.

8. (5 pts) Multiply and simplify $(x - (3 + 2i))(x - (3 - 2i))$

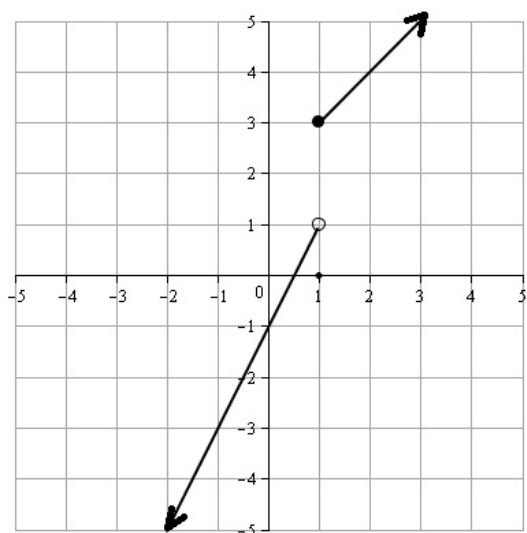


Bonus: (5 pts) Find a polynomial, in factored form, that will *rational* coefficients after expanding, and a leading coefficient of 13, and the zeros described, below. *Do not expand.*

Zeros: $x = 2 + \sqrt{3}$, multiplicity 1; $x = 2 + 3i$, multiplicity 2; $x = -5$, multiplicity 17.

Bonus: (5 pts) What is the domain of $\sqrt{\frac{(x+2)^2}{(x-1)(x-4)}}$? (See Page 1!)

Bonus: (5 pts) Write the equation of the piecewise function whose graph is shown.



Bonus: (5 pts) List all intercepts, holes and asymptotes for $R(x) = \frac{(x-5)(x+2)(x-1)}{(x+2)(x-3)} = \frac{x^3 - 4x^2 - 7x + 10}{x^2 - x - 6}$.