

PRACTICE TEST FOR THE TAKE-HOME I JUST GAVE YOU.

Use separate paper to do the work on this take-home test. Start a fresh sheet of paper to show work on #4. Use paper without lines. Use only one side of each sheet of paper. *I will not grade work written on the backs of pages.* Write clearly and make sure your pencil work is *dark*. It's a struggle for me to read faint print.

Let $f(x) = 3x^5 - 10x^4 - 22x^3 + 88x^2 + 56x - 160$. We will say everything we can about this polynomial.

1. (2 pts) Describe the end behavior of the graph of f with a simple graphic.
2. (2 pts) Use Descartes' Rule of Signs to determine the *possible* number of positive and negative zeroes of f .
3. (2 pts) Use the Rational Zeroes Theorem to determine the possible rational zeroes of f .
4. (2 pts) Informed by your work, above, use synthetic division to find the zeroes. Each time you find a zero, it *should* reduce (depress) the question by one degree. Each time you find a zero, you should thereafter be working with a *depressed polynomial* that is of lesser degree.
5. (2 pts) From your work, above, factor f over the real numbers. This will involve an irreducible quadratic factor.
6. (2 pts) From your work above, factor f over the complex numbers. This should split f into linear factors.
7. (2 pts) Give a rough sketch of f that shows all intercepts.
8. (2 pts) Sketch the graph of $\frac{x^2 + 3x + 2}{x^2 + 2x - 8} = \frac{(x+2)(x+1)}{(x+4)(x-2)}$. Factored and expanded form given for convenience. Show all asymptotes, intercepts and any holes.
9. (2 pts) The graph of $g(x) = \frac{x^3 - x^2 - 4x + 4}{x^3 - 12x + 16} = \frac{(x+2)(x+1)(x-3)}{(x+4)(x-2)(x-3)}$ differs from the graph of f , in #8, in only one small detail. Sketch the graph of g , showing all asymptotes, intercepts and holes.
10. (2 pts) Sketch the graph of $h(x) = \frac{x^2 + 3x + 2}{x + 4}$, showing all asymptotes, intercepts and holes.