MAT 121-G81 Test 3 Take-Home – Fall, 2014 Name_____

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 $f(x) = 6x^5 + 4x^4 - 35x^3 - x^2 + 64x - 20$. We'll say everything we can about this polynomial that's worth saying.

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, *and a graphing utility of some sort*, use synthetic division to find the zeros. 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 you 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 $R(x) = \dfrac{x^2 - 5x - 6}{x^2 - 5x + 6}$. Show all asymptotes, intercepts and any holes.
9. (2 pts) The graph of $g(x) = \dfrac{x^3 - 9x^2 + 14x + 24}{x^3 - 9x^2 + 26x - 24}$ 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 $h(x) = \dfrac{2x^2 - 5x - 3}{x - 4}$, showing all asymptotes, intercepts and holes.