

# Math 151 - Test 3

April 20, 2016

Name \_\_\_\_\_

Score \_\_\_\_\_

**Show all work.** You will not receive credit if work is not shown. Supply explanations where necessary.

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1. (8 points) Construct a 3rd degree polynomial with real coefficients such that two of its zeros are 0 and  $2+i$  and its leading coefficient is 4. Write your final answer in standard form (not factored form).

2. (4 points) Find the degree and the  $y$ -intercept:  $f(x) = (x + 1)(x - 2)^7$

3. (12 points) Consider the polynomial  $p(x) = x^4 + x^3 - 9x^2 - 7x + 14$ . Find the complete factorization of  $p$ . **You will only be given credit for the work you show.** (Hint: Two rational zeros should be easy to find. Use synthetic division to deflate.)

4. (4 points) A polynomial with only real coefficients has the zeros  $2 + 3i$  and  $-9i$ . What are another two of its zeros?

5. (8 points) Find the real and complex zeros of  $g(x) = x^3 - 10x^2 + 34x$ .

6. (4 points) Use the Rational Zeros Theorem to list all possible rational zeros.

$$p(x) = 3x^4 - 5x^3 + 5x - 2$$

7. (8 points) Completely factor:  $x^3 - 2x^2 - x + 2$

8. (6 points) Use synthetic division to write the expression below in the form  $q(x) + \frac{r(x)}{d(x)}$ .

$$\frac{x^3 + 5x^2 - 17x - 13}{x - 2}$$

9. (6 points) Use synthetic division to show that  $(x - 3)$  is a factor of  $x^4 - 3x^3 + 7x - 21$ .

10. (8 points) Use long division to write the expression below in the form  $q(x) + \frac{r(x)}{d(x)}$ .

$$\frac{x^3 + 2x^2 + 3x - 7}{x^2 + x - 2}$$

11. (12 points) Consider the polynomial  $f(x) = -(x + 1)^3(x - 4)(3x - 1)^2$ .

(a) Determine the degree of  $f$  and the leading coefficient.

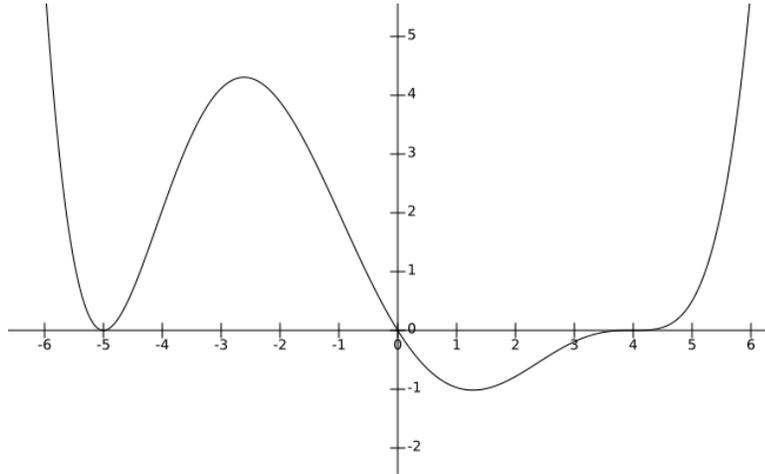
(b) State the zeros of  $f$  and their corresponding multiplicities.

(c) Describe the end behavior of the graph of  $f$ . (A picture or diagram will work!)

(d) Determine the  $y$ -intercept.

(e) Roughly sketch the graph of  $f$ . Be sure that your graph correctly illustrates the  $y$ -intercept, the end behavior, and the behavior near the  $x$ -intercepts.

12. (6 points) Give the factored form of a polynomial whose graph has the same general shape of the one given below.



13. (6 points) Determine the vertical asymptotes of the graph of  $R(x) = \frac{x + 1}{x^2 - 5x + 6}$ .

14. (4 points) What is the domain of the rational function  $F(x) = \frac{x - 5}{x + 5}$ ?

15. (4 points) What are the  $x$ - and  $y$ -intercepts of the graph of the function  $F(x)$  in problem #14?