Math 151 - Test 2

October 20, 2015

Name _____

Score _____

Show all work. Supply explanations where necessary.

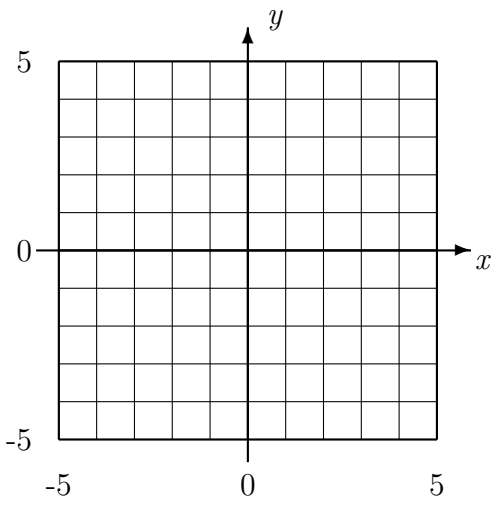
1. (7 points) Let $f(x) = x^2 + 1$ and $g(x) = x + 4$.

   (a) Find and simplify a formula for $(f \circ g)(x)$.

   (b) Evaluate $(f \circ g)(-2)$.

   (c) Evaluate $(g \circ f)(4)$.

2. (10 points) Find the inverse of the function $g(x) = \sqrt{x+3}$ and sketch the graphs of both g and g^{-1}. Label which is which.



3. (4 points) Find two functions f and g so that $(f \circ g)(x) = (3x+2)^5 - (3x+2)^2$.

4. (2 points) Some values of the function h are given in the table below. Assuming that h has an inverse function, use the data in the table to determine $h^{-1}(8)$.

x	0	2	4	6	8
$h(x)$	1	2	5	8	7

5. (8 points) Find the exact values of the real and complex zeros of $H(x) = 2x^4 - 11x^3 + 20x^2$. Show all work.

6. (6 points) Use synthetic division to determine $Q(-5)$ when

$$Q(x) = 3x^4 - 5x^3 + 12x^2 - 7x + 3.$$

7. (2 points) True or False: If $3 - 5i$ is a zero of a 2nd degree polynomial with real coefficients, then $-3 + 5i$ is also a zero.

8. (12 points) Consider the polynomial $p(x) = 6x^3 - 13x^2 - 4x + 1$.

   (a) List the possible rational zeros of $p(x)$.

   (b) The polynomial $p(x)$ has one rational zero and two irrational zeros. Find the exact values of the zeros. Show all work.

9. (12 points) Consider the polynomial $f(x) = 2(x-3)^2(x+1)^3$.

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

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

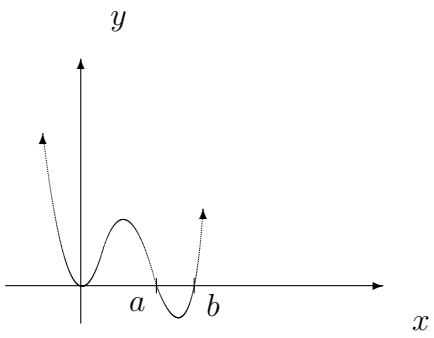
(c) Describe the end behavior of the graph of f. (A picture or diagram will work!)

(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.

10. (8 points) Solve the polynomial inequality $x^2 + x \leq 6$. Write your solution in interval notation.

11. (6 points) Which polynomial below has the given graph? State at least two reasons for your choice.



(a) $p(x) = x(x-a)(x-b)$

(b) $p(x) = (x+a)(x+b)$

(c) $p(x) = x^2(x-a)(x-b)$

(d) $p(x) = x(x-a)^2(x-b)^2$

12. (3 points) Use the graph above (problem #11) to solve the inequality $p(x) > 0$. Write your solution in interval notation.

13. (10 points) Use polynomial long division to compute the quotient and remainder when $x^4 - 3x^3 + 8x - 6$ is divided by $x^2 + 2x$. Write your answer in the form $q(x) + r(x)/d(x)$.

14. (10 points) Consider the polynomial $P(x) = 2x^3 - x^2 - 13x - 6$.

    (a) List all possible rational zeros.

    (b) Use your graphing calculator to determine which, if any, of the possible rational zeros are actual zeros.

    (c) Use your zeros to determine the complete factorization of P.