HOMEWORK 5 - MATH 111

DUE DATE: Friday, October 28

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Read each problem very carefully before starting to solve it. Each question is worth 1 point. It is necessary to show your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

- 1. Use your graphing techniques (reflections, shifts, stretchings) to draw the graph of the function $f(x) = \frac{1}{2}(x-2)^3 + 1$ starting from the graph of the function $g(x) = x^3$. Show clearly all the transformations performed.
- 2. Find the intercepts, form the sign table and then *roughly* sketch the graph of the functions $f(x) = x^2(x-2)(x+3)$ and $g(x) = x^3 2x^2 8x$.
- 3. Find a polynomial function of degree 5, with roots 2 of multiplicity 2, 7 of multiplicity 1 and -1 of multiplicity 2, whose graph passes through the point (4, -12).
- 4. Solve the polynomial inequalities $(x-1)^2(x+3)(x-5)^3 \le 0$ and $x^3(x+5)^2(x-1)(x-2)^5 > 0$.
- 5. Find the horizontal and the vertical asymptotes of the following rational functions:
 - (a) $f(x) = \frac{3x-2}{x+3}$, (b) $g(x) = \frac{x-1}{x^2-x-6}$ (c) $h(x) = \frac{2x^2+4x}{x^2-4x-5}$.
- 6. Find the domain, the intercepts, the asymptotes, form the sign table and then roughly graph the rational functions:

(a)
$$f(x) = \frac{1}{x(x+1)^2}$$

(b) $g(x) = \frac{x^2+5x}{x^2-x-6}$.

- 7. Suppose that a rational function f has a numerator of degree 2, a denominator of degree 2, x-intercepts -1 and 3 and vertical asymptotes x = -3 and x = 1 and horizontal asymptote y = 2. Find a possible formula for the function and verify your answer by studying its graph as in the previous exercise.
- 8. Solve the rational inequalities

(a)
$$\frac{x^3 - 5x^2 + 6x}{x^2 - 8x + 7} \ge 0$$

(b) $\frac{(x-1)^2(x+2)}{(x-3)(x+5)^2} \le 0.$