Review Test #2
Chapter 3 (3.2 – 3.5), Chapter 4 (4.1 – 4.6), and Section 5.6

To prepare for the test, you may study:

- All examples and exercises done in class
- Quiz #2
- Handout Sections 3.2 & 3.3 – Synthetic Division; Zeros of Polynomials – all exercises (see website for handout and solutions)
- Handout Section 3.5 – Graphs of Rational Functions - all exercises (see website for handout and solutions)
- **Handout Sections 4.3 - 4.6 – all exercises** (see website for handout and solutions)
- **All homework problems from the listed sections.**

More practice

1) Consider the following polynomial function $f(x) = 3x^4 - 4x^3 - 22x^2 + 15x + 18$.
Questions a-g below relate to this polynomial function.

a) Use the leading term to describe the long-term behavior of this function; that is, what happens as $x \to \pm\infty$.
b) Use synthetic division to divide $f(x)$ by $x - 1$ and relate dividend, divisor, quotient and remainder in an equation.
c) State why the condition for the theorem on rational zeros is satisfied and use the theorem on rational zeros to list all possible rational zeros for $f(x)$.
d) Find all the zeros of the polynomial.
e) Factor $f(x)$ completely.
f) What are the x- and y-intercepts of the graph?
g) Sketch a graph of $f(x)$ showing how it passes through its intercepts.

2) $f(x) = 2x^4 - 19x^3 + 57x^2 - 64x + 20$.

Questions a – g below relate to this polynomial function.

a) Describe the long-term behavior of this function; that is, what happens as $|x| \to \infty$.
b) Using Descartes' rule of signs, determine the number of positive real zeros and the number of negative real zeros for $f(x)$.
c) State why the condition for the theorem on rational zeros is satisfied and use the theorem on rational zeros to list possible rational zeros.
d) Find all the real zeros of $f(x)$.
e) What are the intercepts of the graph of $f(x)$? Write each intercept as an ordered pair.
f) Sketch a graph of $f(x)$ showing how it passes through its intercepts. Plot additional points, as necessary, to get the shape of the graph. Clearly label all the points.

3) Let $g(x)=\dfrac{1}{x+1}$

a) Sketch a graph of the function (using transformations or by finding asymptotes and plotting points).
b) What are the asymptotes for the graph?
c) State its domain and range.
d) Find the intercepts.
e) Calculate $g(-2)$.
f) Solve $g(x)=-2$.
g) Find points that correspond to parts (d) and (e) on the graph of the function.

4) Let $f(t)=1+2\ln(t-1)$.

a) Graph the function.
b) State the domain, range, and vertical asymptote.
c) Find the exact *x*- and *y*-intercepts (if any).
d) Does the function have an inverse> Explain. Find $f^{-1}(x)$.
e) Graph the inverse $f^{-1}(x)$ showing the symmetry through $y=x$.
f) State the domain, range, and horizontal asymptote for the inverse function $f^{-1}(x)$.
g) Find the exact *x*- and *y*-intercepts of the inverse function $f^{-1}(x)$ (if any).

5) Let $f(x)=2^{x+1}-1$.

a) Graph the function.
b) State the domain, range, and horizontal asymptote.
c) Find the exact *x*- and *y*-intercepts (if any).
d) Does the function have an inverse? Explain. Find the inverse function $f^{-1}(x)$.
e) Graph the inverse function showing how it can be obtained from the graph of f.
f) Find the exact *x*- and *y*-intercepts for $f^{-1}(x)$ (if any).

6) Find the domain of each function:

a) $f(x)=\log(15-4x)$ b) $g(x)=\ln(x^2-25)$ c) $h(x)=\log_2\dfrac{3-4x}{x+2}$

(Answers: a) $x\in\left(-\infty,\dfrac{15}{4}\right)$; b) $x\in(-\infty,-5)\cup(5,\infty)$; c) $x\in\left(-2,\dfrac{3}{4}\right)$

7) a) Graph $f(x)=-\log_3(x+2)+1$ using transformations. Find domain, range, asymptote, exact intercepts.
b) Find the inverse of the function, as well as its domain and range. Graph the inverse function showing how it can be obtained from the graph of f. Find the exact intercepts for the inverse function (if any).

8) Textbook, Section 5.6 – Exercises # 42, 43, 53 – 58

9) Graph the solution set of the system of inequalities:

$$\begin{cases} x\geq -3 \\ y<1+2^{x+1} \\ y>\log_3 x \end{cases}$$