Review Sheet for Test 3

The only new understood instruction on this test is that all asymptotes must be given as lines.

Following is a list of concepts you should know for the test:

Sections 3.1-3.3:	*(9 pts.)*	Use the remainder theorem, the intermediate value theorem, the upper bound theorem, and the lower bound theorem as necessary to obtain information about the graph of a polynomial function.
Section 3.1:	*(13 pts.)*	Graph a polynomial function accurately.
Section 3.3:	*(13 pts.)*	Determine the roots of a polynomial function using synthetic division, factoring, the rational root theorem, Descartes' rule of signs, the upper bound theorem, and the lower bound theorem as necessary.
Section 3.6:	*(14 pts.)*	Graph a rational function accurately.
Sections 4.1-4.2:	*(16 pts.)*	Perform transformations on exponential and/or logarithmic graphs.
Section 4.1:	*(7 pts.)*	Compute interest compounded on a regular basis.
	(6 pts.)	Compute interest compounded continuously.
Section 4.3:	*(2 pts.)*	Expand and/or combine logarithms.
Section 4.4:	*(8 pts.)*	Solve exponential and/or logarithmic equations.
Section 4.5:	*(12 pts.)*	Solve word problems involving exponentials and/or logarithms.

Theorems and Formulas

The intermediate value theorem for polynomials: If $P(x)$ is a polynomial function, $a < b$, and $P(a) \neq P(b)$, then, for any real number k strictly between $P(a)$ and $P(b)$, there exists a real number c with $a < c < b$ such that $P(c) = k$. (Note that $k = 0$ is used most frequently in this class.)

The remainder theorem: If $P(x)$ is a polynomial and c is a real number, then $P(c)$ is equal to the remainder from dividing $P(x)$ by $x - c$.

The rational root theorem: If $P(x)$ is a polynomial function with integer coefficients, the only possibilities for rational roots of $P(x)$ are of the form $\frac{p}{q}$, where p is a factor of the constant term of $P(x)$ and q is a factor of the leading coefficient of $P(x)$.

Descartes' rule of signs: If $P(x)$ is a polynomial function, then the number of positive real roots of $P(x)$ is equal to the number of variations in sign of $P(x)$ or is less than that by some multiple of 2. (For the number of negative real roots of $P(x)$, a similar procedure is used on $P(-x)$.)

The upper bound theorem: If $P(x)$ is a polynomial function and $c > 0$ such that, when $P(x)$ is synthetically divided by $x - c$, the bottom row consists solely of nonnegative numbers, then none of the real roots of $P(x)$ is larger than c.

The lower bound theorem: If $P(x)$ is a polynomial function and $c < 0$ such that, when $P(x)$ is synthetically divided by $x - c$, the bottom row consists of numbers alternating in sign, then none of the real roots of $P(x)$ is smaller than c.

Interest compounded on a regular basis: Let P be the principal, r be the interest rate (as a decimal), n be the number of compoundings per year, t be the time elapsed (in years), and A be the final amount. Then

$$A = P\left(1 + \frac{r}{n}\right)^{nt}.$$

Interest compounded continuously: Let P be the principal, r be the interest rate (as a decimal), t be the time elapsed (in years), and A be the final amount. Then

$$A = Pe^{rt}.$$

Algebraic properties of logarithms:

$$b^x = a \text{ iff } \log_b a = x$$
$$b^{\log_b x} = x$$
$$\log_b(mn) = \log_b m + \log_b n$$
$$\log_b\left(\frac{m}{n}\right) = \log_b m - \log_b n$$
$$\log_b(m^n) = n \log_b m$$

Change of base for logarithms: $\log_c x = \dfrac{\log_b x}{\log_b c}$