List of Topics for Exam 1, Math 341.

Assume that $\lim x_n = x$ and $\lim y_n = y$.

You should know the proofs of the following results:

(1) $\lim (x_n + y_n) = x + y$ p. 64

(2) $|x_n|$ is bounded, i.e, there is an $M > 0$ so that $|x_n| \leq M$ for all n. p. 63

(3) Use the result in #2 to prove that $\lim x_n y_n = xy$ p. 64

(4) If $y \neq 0$, then there is a constant K so that if $n \geq K$, then $|y_n| > \frac{|y|}{2}$ p. 65

(5) Use the result in # 4 to show that if $y \neq 0$, then $\lim \left(\frac{1}{y_n}\right) = \frac{1}{y}$. p. 65

(6) If (x_n) tends to $+\infty$ and if $\lim y_n = y \neq 0$, then $\lim (x_n y_n) = +\infty$ p. 92

(7) If $\lim x_n = 0$ and $|y_n| \leq M > 0$ for all $n \in \mathbb{N}$, then $\lim (x_n y_n) = 0$ p. 64

(8) State the definition of $\sup S = u$. Show that if $\sup S = u$ and $w < u$, then there is an element $s_0 \in S$ such that $w < s_0 \leq u$. p. 37-38.

(12) The polynomial equation $x^3 - 5x + 1 = 0$ has a root r with $0 < r < 1/2$. Find a contractive sequence that can be used to calculate r. What is the constant of the sequence p. 88 - 90

(13) Prove Bernoulli's Inequality (by induction). p. 30

(14) Use the standard "diagonal" argument which shows that the positive rational numbers are denumerable, what is the 11-th prime.

(15) Use the Ratio Test, show that p. 69

$\lim n^2 b^n = 0$ if $0 < b < 1$.

(16) Compute $\lim \frac{n!}{n^n}$.

(17) State the Bolzano - Weierstrass Thm.

p. 81.