Relative Rates of Growth Homework (due 2/22/05)

For each pair of functions given, determine which one grows faster as $x \to \infty$ or state that they grow at the same rate. You must give detailed arguments using limits for #2c,d,e and #3a,b,c,e,g. For each of the others you may use limits or just explain your reasoning with a sentence. Try to notice patterns while you do this!

1.a) $x^2$, $2 - \sqrt{x} + 4x^2$
   b) $x^2$, $\sin(x^3) + x^2$
   c) $100x^2$, $2 - \sqrt{x} + 4x^3$
   d) $100x^2$, $2^x + x^2$

2.a) $x^{100}$, $e^x$
   b) $2^x$, $e^x$
   c) $2^x$, $e^{-x}$
   d) $22^x$, $e^x$
   e) $x^2^x$, $e^x$
   f) $x$, $e^{\cos x}$

3.a) $\ln x$, $\log_2 x$
   b) $\ln x$, $x$
   c) $\ln x$, $\sqrt{x}$
   d) $\ln x$, $\cos x$
   e) $\ln x$, $\ln x^2$
   f) $\ln x$, $(\ln x)^2$
   g) $\ln x$, $\ln(\ln x)$