1. As discussed in class, and in the book, the harmonic series, H_n, is the sum of the reciprocals of the first n numbers. The *odd harmonic series*, H_n^{odd}, is the sum of the reciprocals of the first n odd numbers.
   (a) We found an upper bound of about $\lg(n+1)$ for the harmonic series. (See the website for a review.) Use a similar method to find an upper bound for the odd harmonic series. Assume n is a "nice" number.
   (b) Use a similar method to find a lower bound for the odd harmonic series. Assume n is a "nice" number. NOTE: There is more than one way to solve this problem. HINT: Take the initial term, 1, out, find a lower bound, and then put the 1 back in.
   (c) Use the integral method to find a lower bound for H_n^{odd}.
   (d) Use the integral method to find an upper bound for H_n^{odd}.
   (e) Give a formula for H_n^{odd} only involving the standard harmonic series H_x, which may occur more than once in the formula, where each x is a function of n. (For example, maybe, $H_n^{\text{odd}} = H_{n^2} - 2H_n + 3H_{2n}$.)
   (f) We know that $H_n = \ln(n) + \gamma + O(1/n)$ (where γ is a constant). Using this fact and Part (e), give an asymptotic formula for H_n^{odd}.

2. Consider the function
$$5n^3 + 8n^2(\lg n)^4 + 9n$$
   (a) What is the high order term?
   (b) What is the second order term?
   (c) What is the third order term?
   (d) Write the function in Theta notation (in the simplest way).

3. For each pair of expressions (A, B) below, indicate whether A is O, o, Ω, ω, or Θ of B. Note that zero, one or more of these relations may hold for a given pair; list all correct ones.

	A	B
(a)	$n^4/5$	$9n^3 + 1000n^2$
(a)	2^n	n^{50}
(b)	$\sqrt{n}$	$(\log n)^{12}$
(c)	$\sqrt{n}$	$n^{\cos(\pi n/8)}$
(d)	100^n	10^{2n}
(e)	$2^{(n^2)}$	10^n
(f)	$\log(n!)$	$n \log n$