18. Find a big-$O$ estimate for $\sum_{j=1}^{n} j(j+1)$.

*20. Show that $n^n$ is not $O(n!)$. 

22. Find all pairs of functions of the same order in this list of functions $n^2 + 2^n, n^2 + 2^{100}, n^2 + 2^{2n}, n^2 + n!, n^2 + 3^n$, and $(n^2 + 1)^2$.

*26. Arrange the function $2^{100n}, 2^{n^2}, 2^n, 2^{2n}, n^{\log n}, n \log n \log \log n, n^{3/2}, n(\log n)^{3/2}$, and $n^{4/3}(\log n)^2$ in a list so that each function is big-$O$ of the next function. 
[Hint: To determine the relative size of some of these functions, take logarithms.]