Team A:	$\tanh(x)$	on $[-2\pi, 2\pi]$.
Team B:	$1/(1+\cos^2 x)$	on $[-3\pi, 3\pi]$.
Team C:	e^{-x^2}	on $[-\pi, \pi]$.
Team D:	$(1-x^2)\ln(1-x^2)$	on $[-1, 1]$.
Team E:	$1/(e^x+1)$	on $[-1, 1]$.
Team F:	$e^{-1/(1-x^2)}$	on $[-1, 1]$.
Team G:	$\sin(x^2)$	on $[-3\sqrt{\pi}, 3\sqrt{\pi}]$.
Team H:	$\sqrt{4-x}$	on $[-2, 2]$.

For each function $f(x)$ defined on an interval $[-\ell, \ell]$:

1. Approximate the function with a truncated power series, $f^{(N)}_{\text{Power}}(x) = \sum_{k=0}^{N} a_k (x/\ell)^k$, constructed to agree with the given function at $N{+}1$ points equally spaced between $-\ell$ and ℓ (including the two endpoints), so the spacing between points is $\Delta x = 2\ell/N$.

2. Approximate the function by a truncated Fourier series, $f^{(N)}_{\text{Fourier}}(x) = \sum_{k=-N/2}^{N/2} b_k \, e^{i\pi k x/\ell}$, constructed to agree with the given function at $N{+}1$ equally spaced points within the interval with spacing $\Delta x = 2\ell/(N{+}1)$.

3. Approximate the function by a truncated Chebyshev series, $f^{(N)}_{\text{Chebyshev}} = \sum_{k=0}^{N} c_k \, T_k(x/\ell)$, constructed to agree with the given function on the "Gauss-Lobatto" grid points, $x_k^{(N)} \equiv -\ell \, \cos(k\pi/N)$, $k = 0, \cdots, N$.

Examine the convergence and accuracy of these different approximations as N increases. For each approximation, estimate the maximum error, $\epsilon(N) \equiv \max_{-\ell \le x \le \ell} |f(x) - f^{(N)}|$. The goal is to find the maximum error correct to one significant digit. Highly accurate maximization is not needed — it is sufficient to test the deviation on a grid of points which is significantly finer than the starting $N+1$ point grid.

What can you learn from these results? In each case, how fast do the coefficients decrease with increasing k? What controls this behavior? Which expansion is most efficient (fewest terms required to obtain good accuracy) for your given test function? Any general conclusions?