1. Write these using $\sum$:

   (a) $\frac{1}{2}x + \frac{1\cdot 3}{2^2\cdot 2!}x^2 + \frac{1\cdot 3\cdot 5}{2^3\cdot 3!}x^3 + \ldots$

   (b) $(x-1)^3 - \frac{(x-1)^5}{2!} + \frac{(x-1)^7}{4!} - \frac{(x-1)^9}{6!} + \ldots$

2. For which values of x do these power series converge? Diverge?

   (a) $\sum_{n=0}^{\infty} n^3 x^n$

   (b) $\sum_{n=1}^{\infty} \frac{2^n(x-1)^n}{n}$

   (c) $\sum_{n=0}^{\infty}(-1)^n \frac{x^{2n}}{(2n)!}$

   (d) $\sum_{n=0}^{\infty} \frac{n^2 x^{2n}}{2^{2n}}$

3. Find the interval of convergence. This INCLUDES checking the endpoints!!

   (a) $\sum_{n=1}^{\infty} \frac{x^{2n+1}}{n!}$

   (b) $\sum_{n=1}^{\infty} \frac{(5x)^n}{\sqrt{n}}$

4. For all t-values for which it converges, the function f is defined by the series

$$f(t) = \sum_{n=0}^{\infty} \frac{(t-7)^n}{5^n}.$$

   (a) Find $f(4)$.

   (b) Find the interval of convergence of $f(t)$.

5. The series $\sum C_n x^n$ converges when $x = -4$ and diverges when $x = 7$. Decide whether each of the following is true or false, or whether this cannot be determined.

   (a) The power series converges when $x = 10$.

(b) The power series converges when $x = 3$.

(c) The power series diverges when $x = 1$.

(d) The power series diverges when $x = 6$.

6. If $\sum C_n(x-3)^n$ converges at $x = 7$ and diverges at $x = 10$, what can you say about the convergence at $x = 11$? At $x = 5$? At $x = 0$?

7. For all x-values for which it converges, the function f is defined by the series

$$f(x) = \sum_{n=0}^{\infty} \frac{x^n}{n!}.$$

(a) What is $f(0)$?

(b) What is the domain of f?

(c) Assuming that f' can be calculated by differentiating the series term-by-term, find the series for $f'(x)$. What do you notice?

(d) Guess what well-known function f is.