Work on these with your partner(s) at the board

1. Consider the power series $P(x) = \sum_{k=1}^{\infty} \frac{x^k}{k2^k} = \frac{x}{2} + \frac{x^2}{2 \cdot 2^2} + \frac{x^3}{3 \cdot 2^3} + \cdots$
   (a) Does $P(x)$ converge or diverge at $x = 1$?
   (b) Does $P(x)$ converge or diverge at $x = -1$?
   (c) Does $P(x)$ converge or diverge at $x = 2$?
   (d) Does $P(x)$ converge or diverge at $x = -2$?
   (e) What is the interval of convergence of $P(x)$?

2. Consider the power series $P(x) = \sum_{k=0}^{\infty} (-1)^k \frac{x^{2k}}{(2k)!} = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \cdots$
   (a) Plot the following partial sums of $P(x)$: $S_0(x), S_2(x), S_4(x)$ and $S_6(x)$
   (b) What well-known function do you think $P(x)$ is equal to?
   (c) Compute $P'(x)$, $P''(x)$, $P'''(x)$, and $P^{(4)}(x)$
   (d) Evaluate $P(0)$, $P'(0)$, $P''(0)$, $P'''(0)$, $P^{(4)}(0)$