Problem One (5 points). Find the Maclaurin series for the function
\[ f(x) = \frac{2 + x}{1 - x}. \]

Solution: We will form the Maclaurin series for \( f(x) \) by manipulating the series for \( \frac{1}{1-x} \). We have:
\[
\frac{2 + x}{1 - x} = (2 + x) \sum_{n=0}^{\infty} x^n = 2 \sum_{n=0}^{\infty} x^n + x \sum_{n=0}^{\infty} x^n = 2 + \sum_{n=1}^{\infty} 2x^n + \sum_{n=1}^{\infty} x^n = 2 + \sum_{n=1}^{\infty} 3x^n.
\]

Problem Two (5 points). Find the interval of convergence of the power series
\[ \sum_{n=1}^{\infty} \frac{(x - 1)^n}{\sqrt{n}}. \]

Solution: We begin by applying the ratio test:
\[
\left| \frac{(x - 1)^{n+1}}{\sqrt{n+1}} \right| \cdot \left| \frac{\sqrt{n}}{(x - 1)^n} \right| = |x - 1| \frac{\sqrt{n}}{\sqrt{n+1}} \to |x - 1| \text{ as } n \to \infty.
\]
It follows that the radius of convergence of this series is 1 and it converges on the interval \((0, 2)\). We now check the endpoints of this interval.

When \( x = 2 \), the series takes the form
\[ \sum_{n=0}^{\infty} \frac{1}{\sqrt{n}}, \]
which diverges by the integral test (for instance).

When \( x = 0 \), the series takes the form
\[ \sum_{n=0}^{\infty} \frac{(-1)^n}{\sqrt{n}}, \]
which converges by the alternating series convergence test.

The interval of convergence for this series is \([0, 2)\).