8. (15 points) For each of the following statements, circle T if the statement is always true, and otherwise circle F.

(a) If the power series \( \sum_{n=0}^{\infty} C_n x^n \) is known to converge at 1 and to diverge at \(-2\), then we can conclude that the power series diverges at 3.

\[
\begin{array}{cc}
  & T & F \\
\end{array}
\]

(b) If \( p(x) \) denotes a density function defined on the interval \([a, b]\), and \( P(x) \) denotes an antiderivative of \( p(x) \), then the function \( P(x) - P(b) + 1 \) is the cumulative distribution function for \( p(x) \).

\[
\begin{array}{cc}
  & T & F \\
\end{array}
\]

(c) If the pair of functions \((x(t), y(t))\) gives a parameterization of the unit circle centered at the origin, then the integral \( \int_0^{2\pi} \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2} \, dt \) is equal to \(2\pi\).

\[
\begin{array}{cc}
  & T & F \\
\end{array}
\]

(d) If \( P_2(x) \) is the second degree Taylor polynomial that approximates a function \( f \) about \( x = 3 \), and if \( E_2(x) = f(x) - P_2(x) \), is the error in the approximation of \( f \) by \( P_2 \), then \( E_2(3) = 0 \), \( E_2'(3) = 0 \), and \( E_2''(3) = 0 \).

\[
\begin{array}{cc}
  & T & F \\
\end{array}
\]

(e) If \( r \) and \( a \) are any positive numbers, then \( \sum_{n=0}^{\infty} a r^n = \frac{a}{1 - r} \).

\[
\begin{array}{cc}
  & T & F \\
\end{array}
\]