Solution of Problem 5

$$
\begin{aligned}
f'(x) &= \frac{1}{(2+x)^2} && \text{(5 pts)} \\
f''(x) &= \frac{-2}{(2+x)^3} \\
f'''(x) &= \frac{6}{(2+x)^4} \\
&\vdots \\
f^{(k)}(x) &= \frac{(-1)^{k+1}k!}{(2+x)^{k+1}} && \text{(5 pts)} \\
\frac{f^{(k)}(-1)}{k!} &= (-1)^{k+1} && \text{(3 pts)} \\
\text{Final answer} \quad &: \quad \sum_{k=1}^{\infty}(-1)^{k+1}(x+1)^k && \text{(5 pts)}
\end{aligned}
$$