1. State the definition of the derivative of a function \( f(x) \).

**Solution:** The definition of the derivative of a function \( f(x) \) is

\[
f'(x) = \lim_{h \to 0} \frac{f(x + h) - f(x)}{h}
\]

if this limit exists.

2. Using the definition of the derivative find the derivative of \( f(x) = \frac{4x}{x + 1} \).

**Solution:**

\[
f'(x) = \lim_{h \to 0} \frac{f(x + h) - f(x)}{h}
\]

\[
= \lim_{h \to 0} \frac{\frac{4(x + h)}{x + h + 1} - \frac{4x}{x + 1}}{h}
\]

\[
= \lim_{h \to 0} \frac{\frac{4(x + h)(x + 1) - 4x(x + h + 1)}{(x + h + 1)(x + 1)}}{h}
\]

\[
= \lim_{h \to 0} \frac{4(x + h)(x + 1) - 4x(x + h + 1)}{h(x + h + 1)(x + 1)}
\]

\[
= \lim_{h \to 0} \frac{4x^2 + 4xh + 4x + 4h - 4x^2 - 4xh - 4x}{h(x + h + 1)(x + 1)}
\]

\[
= \lim_{h \to 0} \frac{4h}{h(x + h + 1)(x + 1)}
\]

\[
= \frac{4}{(x + 1)^2}
\]