Please answer the following questions. Your answers will be evaluated on their correctness, completeness, and use of mathematical concepts we have covered. Please show all work and write out your work neatly. Answers without supporting work will receive no credit.

1. Compute the derivative of \( f(x) \) using the formulas for derivatives we have learned. Simplify your final answer by combining “like” powers of \( x \).

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

Using the quotient rule for derivatives we obtain

\[
 f'(x) = \frac{\frac{d}{dx}(x - 2)(x^2 + x + 1) - (x - 2)\frac{d}{dx}(x^2 + x + 1)}{(x^2 + x + 1)^2}
\]

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

\[
 = \frac{(x^2 + x + 1) - (2x^2 - 3x - 2)}{(x^2 + x + 1)^2}
\]

\[
 = \frac{-x^2 + 4x + 3}{(x^2 + x + 1)^2}.
\]
2. Compute the derivative of $f(x)$ using the formulas for derivatives we have learned.

$$f(x) = 4x^2 \tan x$$

Using the product rule for derivatives we obtain

$$f'(x) = \left[ \frac{d}{dx}(4x^2) \right] \tan x + 4x^2 \frac{d}{dx} \tan x$$

$$= [8x] \tan x + 4x^2 \sec^2 x$$

$$= 8x \tan x + 4x^2 \sec^2 x.$$