1. Compute the derivative of
\[ y = \frac{\cos(x)}{1 + \sin(x)} \]
and do not simplify your results:

Solution.
\[ y' = \frac{(1 + \sin(x))(-\sin(x)) - \cos^2(x)}{(1 + \sin(x))^2} = \frac{-\sin(x) - 1}{(1 + \sin(x))^2} = \frac{1}{1 + \sin(x)}. \]

2. Suppose that a particle moving in a straight line has position (measured in meters)
\[ s(t) = t^2 - 3t + 2, \quad 0 \leq t \leq 2. \]

Determine
(a) the average velocity;
(b) the speed at \( t = 0 \) and at \( t = 2 \);
(c) when the particle changes direction.

Solution. (a) Since \( s(0) = 2 \) and \( s(2) = 0 \),
\[ \frac{\Delta s}{\Delta t} = \frac{0 - 2}{2 - 1} = -1. \]
The average velocity on this interval is \(-1\) meter/second.
(b) \[ v(t) = s'(t) = 2t - 3. \]
Initially, \( v(0) = -3. \) Finally, \( v(2) = 1. \) The initial speed is \(-3\) meters/second. The final speed is \(1\) meter/second.
(c) We have \( v(t) = 0 \) when \( t = 3/2 \). The velocity is negative earlier than this time, and it is positive later than this moment. The particle changes directions at \( t = 3/2 \).