1. Let

\[ f(x) = \begin{cases} 
0 & \text{if } x < 0 \\
\frac{x}{1} & \text{if } 0 \leq x \leq 1 \\
2 - x & \text{if } 1 < x \geq 2 \\
0 & \text{if } x > 2 
\end{cases} \]

and define a new function \( g(x) = \int_0^x f(t) \, dt \).

(a) Find an expression for \( g(x) \) similar to the one for \( f(x) \).

(b) Sketch the graphs of \( f \) and \( g \).

2. In the problem below, the identities \( \cos\left(\frac{\pi}{2} - x\right) = \sin(x) \) and \( \sin^2(x) + \cos^2(x) = 1 \) will be useful.

(a) Use substitution to show that \( \int_0^{\pi/2} f(\sin x) \, dx = \int_0^{\pi/2} f(\cos x) \, dx \) for any continuous function \( f \).

(b) Using part (a) and the second identity above, calculate \( \int_0^{\pi/2} \sin^2(x) \, dx \) and \( \int_0^{\pi/2} \cos^2(x) \, dx \).