Let $f(x) = cosx$ and $g(x) = \frac{2x^2}{1-x}$

a) Show that $g \circ f(x) = 1$ can be written as $2cos^2x + cosx - 1 = 0$

b) Hence, solve $g \circ f(x) = 1$ for $-\pi \leq x \leq \pi$

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a)

$$g \circ f(x) = \frac{2(cosx)^2}{1-(cosx)}$$

$$g \circ f(x) = 1 \Rightarrow \frac{2cos^2x}{1-cosx} = 1$$

$$2cos^2x = 1 - cosx$$

$$2cos^2x + cosx - 1 = 0$$

b)

$$2cos^2x + cosx - 1 = 0$$

Let $y = cosx$

$$2y^2 + y - 1 = 0$$

$$(2y-1)(y+1) = 0$$

$$y = \frac{1}{2}, y = -1$$

$$cosx = \frac{1}{2}, cosx = -1$$

$$Arccos\left(\frac{1}{2}\right) = \frac{\pi}{3}$$

$$Arccos(-1) = \pi$$

Solve $\boldsymbol{-\pi \leq x \leq \pi}$

$$\boldsymbol{x = -\pi, -\frac{\pi}{3}, \frac{\pi}{3}, \pi}$$