

**Exercise 11**

Differentiate.

$$f(\theta) = \frac{\sin \theta}{1 + \cos \theta}$$

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**Solution**Use the quotient rule to differentiate  $f(\theta)$ .

$$\begin{aligned} f'(\theta) &= \frac{d}{d\theta}[f(\theta)] \\ &= \frac{d}{d\theta} \left( \frac{\sin \theta}{1 + \cos \theta} \right) \\ &= \frac{\left[ \frac{d}{d\theta}(\sin \theta) \right] (1 + \cos \theta) - \left[ \frac{d}{d\theta}(1 + \cos \theta) \right] (\sin \theta)}{(1 + \cos \theta)^2} \\ &= \frac{(\cos \theta)(1 + \cos \theta) - (-\sin \theta)(\sin \theta)}{(1 + \cos \theta)^2} \\ &= \frac{\cos \theta + \cos^2 \theta + \sin^2 \theta}{(1 + \cos \theta)^2} \\ &= \frac{\cos \theta + 1}{(1 + \cos \theta)^2} \\ &= \frac{1}{1 + \cos \theta} \end{aligned}$$