**Theorem** [UNDER CONSTRUCTION! The von Mises distribution appears to not have the scaling property.] The von Mises distribution has the scaling property. That is, if $X \sim \text{von Mises}(\kappa, \mu)$ then $Y = cX$ also has the von Mises distribution.

**Proof** [UNDER CONSTRUCTION! The von Mises distribution appears to not have the scaling property.] Let the random variable $X$ have the von Mises($\kappa, \mu$) distribution with probability density function

$$f(x) = \frac{e^{\kappa \cos(x-\mu)}}{2\pi I_0(\kappa)} \quad 0 < x < 2\pi,$$

where

$$I_0(\kappa) = \sum_{i=0}^{\infty} \frac{\kappa^{2i}}{2^i (i!)^2}.$$ 

Let $c$ be a positive, real constant. The transformation $Y = g(X) = cX$ is a 1–1 transformation from $X = \{x \mid 0 < x < 2\pi\}$ to $Y = \{y \mid 0 < y < 2\pi\}$ with inverse $X = g^{-1}(Y) = Y/c$ and Jacobian

$$\frac{dX}{dY} = \frac{1}{c}.$$ 

Therefore, by the transformation technique, the probability density function of $Y$ is

$$f_Y(y) = f_X(g^{-1}(y)) \left| \frac{dx}{dy} \right| = \frac{e^{\kappa \cos(y/c-\mu)}}{2\pi I_0(\kappa)} \left| \frac{1}{c} \right|,$$

which is the probability density function of a von Mises() random variable.