FIGURE P9-11

Problem 9-46
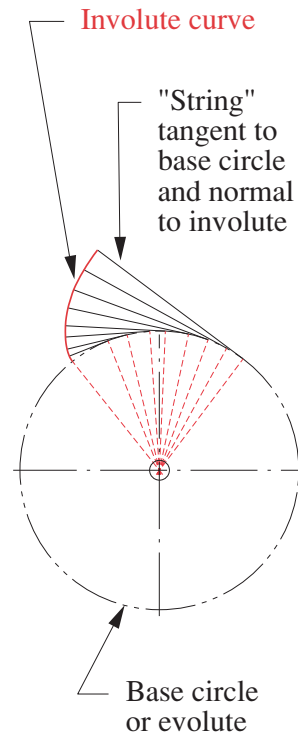

FIGURE 9-5

Development of the
involute of a circle

9-46   Figure P9-11 shows an involute that has been generated from a base circle of radius r_b.
        Point A is simultaneously on the base circle and the involute. Point B is any point on the
        involute curve and point C is on the base circle where a line drawn from point B is tangent
        to the base circle. Point O is the center of the base circle. The angle ϕ_β (angle BOC) is
        known as the *involute pressure angle* corresponding to point B (not to be confused with
        the *pressure angle of two gears in mesh*, which is defined on page 467). The angle AOB
        is known as the *involute of* ϕ_β and is often designated as *inv* ϕ_β. Using the definition of
        the involute tooth form and Figure 9-5 (p. 465), derive an equation for *inv* ϕ_β as a function
        of ϕ_β alone.

9-47   Using the data and definitions from Problem 9-46, show that when the point B is at the
        pitch circle the *involute pressure angle* is equal to the *pressure angle of two gears in mesh*.

9-48   Using the data and definitions from Problem 9-46 and with the point B at the pitch circle
        where the involute pressure angle ϕ_β is equal to the pressure angle ϕ of two gears in mesh,
        derive equation 9.4b (p. 471).

$$p_b = p_c \cos\phi \qquad\qquad\qquad (9.4b)$$