

Equation Of Skiing :

$$\frac{V^4}{g^2} + r_t \frac{2V^2}{g} \sin \alpha \cos \beta + r_t^2 (\sin^2 \alpha \cos^2 \beta + \cos^2 \alpha) = K^2 \cos^2 \alpha$$

Worked Example : Computing r_t (turn radius)

Ski Geometry Constant(side cut radius) $K = 195$ ft (205 SL ski)

Slope gradient $\alpha = 30$ degrees

Speed $V = 66$ ft/sec (45 mph)

Gravitational acceleration $g = 32$ ft/sec²

Traverse angle $\beta = 45$ degrees

$$18530 + 64 r_t \cos \beta + r_t^2 (0.25 \cos^2 \beta + 0.75) = 28518.75$$

Quadratic equation : $ax^2 + bx + c = 0$

$$r_t = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$a = 0.9375$$

$$b = 45.255$$

$$c = 18530 - 28518.75 = -9988.75$$

The negative result is the Upper Quadrant : 130.14 ft

Lower Quadrant : 81.87 ft

$$\text{Ratio} = 130.14 / 81.87 = 1.59$$