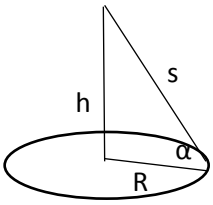
Answer on Question #64921 – Math – Calculus

1. $R = {v_0}^2 * \frac{\sin(2\alpha)}{g}$; if $R = R_{max}$ then $\sin(2\alpha) = 1 \Rightarrow 2\alpha = 90° \Rightarrow \alpha = 45°$.

2.



$$I = k * \frac{\sin(\alpha)}{s^2}; \cos(\alpha) = \frac{R}{s}; s = \frac{R}{\cos(\alpha)}; \quad I = k * \sin(\alpha) * \frac{\cos^2(a)}{R^2};\ \text{if}\ I = I_{max}\ \text{then}\ I'_a = 0;$$

$$I'_a = \frac{k}{R^2}\left(sin(\alpha)cos^2(\alpha)\right)' =$$

$$= (cos\alpha \cdot \cos^2\alpha - 2cos\alpha \cdot sin\,\alpha \cdot sin\alpha)\frac{k}{R^2} = cos\alpha(\cos^2\alpha - 2\sin^2\alpha)\frac{k}{R^2} = 0 \Rightarrow$$

$\Rightarrow \cos^2\alpha = 2\sin^2\alpha$ or $cos(\alpha) = 0 \Rightarrow \quad cot^2\alpha = 2$ or $\alpha = \frac{\pi}{2}$.

From a geometrical point of view the case $\alpha = \frac{\pi}{2}$ is impossible.

Then

$$cot(a_{max}) = \sqrt{2} \Rightarrow\ \alpha_{max} = 35.26° \Rightarrow h_{max} = R * tan(a_{max}) = \frac{R}{\sqrt{2}} = 1.41 feet.$$

Answer: 1. $45°$; **2.** $1.41 feet$.