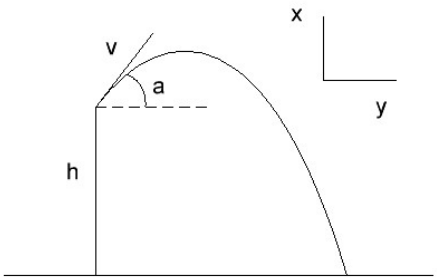

$$x = h + v*\sin(a)*t - \frac{g*t^2}{2} = 0$$

$$t^2 - \frac{2v*\sin(a)}{g}*t - \frac{2h}{g} = 0$$

$$D = \left(\frac{2v*\sin(a)}{g}\right)^2 + 4\left(\frac{2h}{g}\right)$$

$$t = \frac{v*\sin(a)}{g} + \sqrt{\left(\frac{v*\sin(a)}{g}\right)^2 + \left(\frac{2h}{g}\right)}$$

$$y = v*\cos(a)*t = v*\cos(a)*\left(\frac{v*\sin(a)}{g} + \sqrt{\left(\frac{v*\sin(a)}{g}\right)^2 + \left(\frac{2h}{g}\right)}\right)$$

$$y = \frac{v^2}{g}*\cos(a)*\left(\sin(a) + \sqrt{\sin^2(a) + \frac{2gh}{v^2}}\right)$$

$$\frac{dy}{da} = \frac{v^2}{g}*\left(-\sin(a)*\left(\sin(a) + \sqrt{\sin^2(a) + \frac{2gh}{v^2}}\right) + \cos(a)*\left(\cos(a) + \frac{2\sin(a)\cos(a)}{2\sqrt{\sin^2(a) + \frac{2gh}{v^2}}}\right)\right) = 0$$

$$\sin(a)*\left(\sin(a) + \sqrt{\sin^2(a) + \frac{2gh}{v^2}}\right) = \cos(a)*\left(\cos(a) + \frac{\sin(a)\cos(a)}{\sqrt{\sin^2(a) + \frac{2gh}{v^2}}}\right)$$

$$\sin(a)*\left(\sin(a) + \sqrt{\sin^2(a) + \frac{2gh}{v^2}}\right) = \cos(a)*\cos(a)*\frac{\sqrt{\sin^2(a) + \frac{2gh}{v^2}} + \sin(a)}{\sqrt{\sin^2(a) + \frac{2gh}{v^2}}}$$

$m.к.\ \sin(a) + \sqrt{\sin^2(a) + \frac{2gh}{v^2}} \neq 0 \Rightarrow$ можно сократить на общ. множитель

$$\sin(a) = \frac{\cos^2(a)}{\sqrt{\sin^2(a) + \frac{2gh}{v^2}}}$$

$$\sin(a)\sqrt{\sin^2(a) + \frac{2gh}{v^2}} = \cos^2(a)$$

$$\sin^2(a)\left(\sin^2(a)+\frac{2gh}{v^2}\right)=\left(1-\sin^2(a)\right)^2$$

$$\sin^4(a)+\sin^2(a)\frac{2gh}{v^2}=1-2\sin^2(a)+\sin^4(a)$$

$$\sin^2(a)\frac{2gh}{v^2}=1-2\sin^2(a)$$

$$\sin^2(a)=\frac{1}{2\left(\frac{gh}{v^2}+1\right)}$$

$$\cos^2(a)=1-\frac{1}{2\left(\frac{gh}{v^2}+1\right)}=\frac{2\left(\frac{gh}{v^2}+1\right)-1}{2\left(\frac{gh}{v^2}+1\right)}=\frac{\frac{2gh}{v^2}+1}{2\left(\frac{gh}{v^2}+1\right)}$$

$$tg(a)=\frac{1}{\sqrt{\frac{2gh}{v^2}+1}}$$

$$y=\frac{v^2}{g}*\cos(a)*\left(\sin(a)+\sqrt{\sin^2(a)+\frac{2gh}{v^2}}\right)$$

$$y=\frac{v^2}{g}*\sqrt{\frac{2*\frac{gh}{v^2}+1}{2*\left(\frac{gh}{v^2}+1\right)}}*\left(\sqrt{\frac{1}{2*\left(\frac{gh}{v^2}+1\right)}}+\sqrt{\frac{1}{2*\left(\frac{gh}{v^2}+1\right)}+\frac{2gh}{v^2}}\right)=$$

$$=\frac{v^2}{2g*\left(\frac{gh}{v^2}+1\right)}*\sqrt{\frac{2gh}{v^2}+1}*\left(1+\sqrt{1+\left(\frac{gh}{v^2}+1\right)\frac{4gh}{v^2}}\right)=$$

$$=\frac{v^2}{2g*\left(\frac{gh}{v^2}+1\right)}*\sqrt{\frac{2gh}{v^2}+1}*\left(1+\sqrt{\left(\frac{2gh}{v^2}\right)^2+2*\left(\frac{2gh}{v^2}\right)+1}\right)=$$

$$=\frac{v^2}{2g*\left(\frac{gh}{v^2}+1\right)}*\sqrt{\frac{2gh}{v^2}+1}*\left(1+\left(\frac{2gh}{v^2}+1\right)\right)=\frac{v^2}{g}*\sqrt{\frac{2gh}{v^2}+1}$$