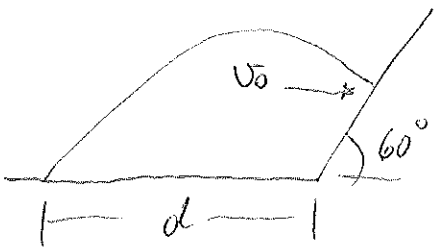
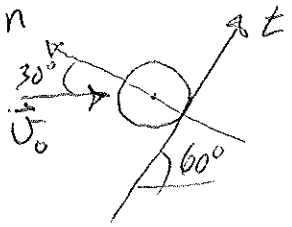
PROB. 13-170

$\vec{v}_0 = (15)\hat{i}\ \frac{m}{s}$, $h_0 = 1.2^m$, $e = 0.9$, FIND $d$




TANGENTIAL DIRECTION: $v_t = (v')_t$

$(v')_t = v_0 \cdot \sin 30^\circ = 15 \cdot \sin 30^\circ = 7.5\ \frac{m}{s}$

NORMAL DIRECTION: RESTITUTION

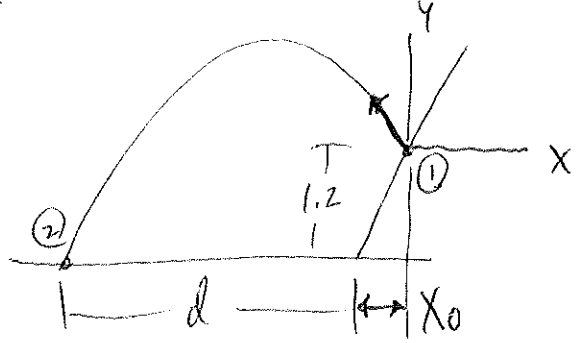
$-(v')_n = e \cdot (v)_n$

$(v')_n = -(0.9)[-(15)\cdot\cos 30^\circ] = +11.69\ \frac{m}{s}$

$(v')_t = (7.5\cdot\cos 60^\circ)\hat{i} + (7.5\cdot\sin 60^\circ)\hat{j} = (3.75)\hat{i} + (6.495)\hat{j}$

$(v_n') = (-11.69\cdot\cos 30^\circ)\hat{i} + (11.69\cdot\sin 30^\circ)\hat{j} = (-10.12)\hat{i} + (5.845)\hat{j}$

$(\vec{v}') = (-6.37)\hat{i} + (12.34)\hat{j}\ \frac{m}{s}$




~~$\tan 60^\circ = \frac{X_0}{1.2}$, $X_0 = 1.2\tan 60^\circ$~~

~~$X_0 = 2.078^m$~~

~~$(x_1, y_1) = (0, 0)$~~

~~$(x_2, y_2) = [-(2.078 + d), -1.2]^m$~~

~~$x = (v_x)_0 \cdot t$~~

PROB. 13-170 CONT.

$\tan 60^\circ = \frac{1.2}{X_0}$, $X_0 = \frac{1.2}{\tan 60^\circ} = 0.6928\ m$

$(X_1, Y_1) = (0, 0)$

$(X_2, Y_2) = [-(d + 0.6928), -1.2]\ m$

$X = (V_x)_0 \cdot t$

WHEN BALL HITS THE GROUND,

$t = \frac{X}{(V_x)_0} = \frac{-(d + 0.6928)}{(-6.37)} = 0.1570 \cdot d + 0.1087$

$Y = (V_y)_0 \cdot t - \frac{1}{2} g t^2$

$(-1.2) = (12.34)(0.157 \cdot d + 0.1087) - \frac{1}{2}(9.81)(0.157 \cdot d + 0.1087)^2$

$-1.2 = 1.937 d + 1.341 - 0.1209 d^2 - 0.1674 d - 0.05795$

$0.1209 d^2 - 1.770 d - 2.483 = 0$

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

$d = \frac{-(-1.77) \pm \sqrt{(1.77)^2 - 4(0.1209)(-2.483)}}{2(0.1209)}$

$d = 7.320 \pm 8.609$

$d = 15.93\ m$