PHYS 101: General Physics 1 **KOÇ UNIVERSITY** **Spring Semester 2015**

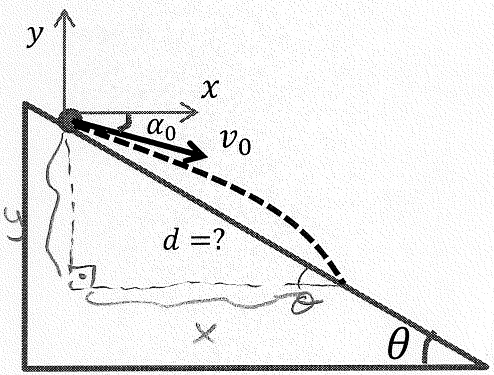
College of Arts and Sciences

Section **Quiz 3-1** **March 2015**

Closed book. No calculators are to be used for this quiz.
Quiz duration: 10 minutes

Name: **Student ID:** **Signature:**

A projectile is launched from the origin with initial speed v_0 on an inclined surface. The launch angle with the horizontal is $\alpha_0 = \frac{-\pi}{6}$. The inclination angle of the surface is $\theta = \frac{\pi}{4}$. Determine the distance of the landing point from the launch point in terms of the given parameters. The gravitational acceleration is g. $(\sin\frac{-\pi}{6} = \frac{-1}{2},\ \cos\frac{-\pi}{6} = \frac{\sqrt{3}}{2},\ \sin\frac{\pi}{4} = \cos\frac{\pi}{4} = \frac{\sqrt{2}}{2})$



$x = v_0 \cos\alpha_0 t$

$y = v_0 \sin\alpha_0 t + \frac{1}{2} g t^2$

$\tan\theta = \frac{y}{x} = \frac{v_0 \sin\alpha_0 t + \frac{1}{2} g t^2}{v_0 \cos\alpha_0 t} = \tan\frac{\pi}{4} = 1$

$\Rightarrow y = x \qquad v_0 \underbrace{\sin\alpha_0}_{1/2} + \frac{1}{2} g t = v_0 \underbrace{\cos\alpha_0}_{\sqrt{3}/2}$

$t = \frac{v_0}{g}(\sqrt{3} - 1)$

$d = \sqrt{x^2 + y^2} = \sqrt{x^2 + x^2} = x\sqrt{2}$

$d = \sqrt{2}\left[v_0 \underbrace{\cos\alpha_0}_{\frac{\sqrt{3}}{2}} \cdot \frac{v_0}{g}(\sqrt{3} - 1)\right] = \frac{v_0^2}{g} \frac{3 - \sqrt{3}}{\sqrt{2}}$

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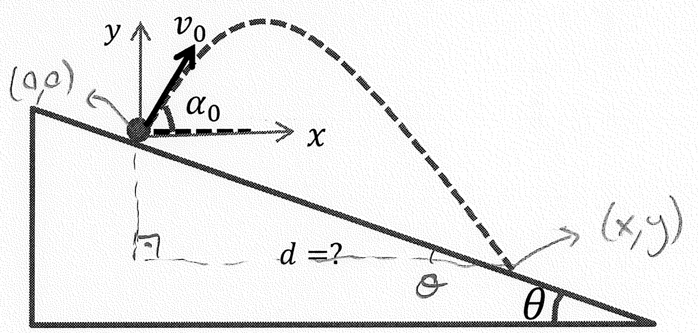
Section **Quiz 3-2** **March 2015**

Closed book. No calculators are to be used for this quiz.
Quiz duration: 10 minutes

Name: **Student ID:** **Signature:**

A projectile is launched from the origin with initial speed v_0 on an inclined surface. The launch angle with the horizontal is $\alpha_0 = \frac{\pi}{3}$. The inclination angle of the surface is $\theta = \frac{\pi}{4}$. Determine the distance of the landing point from the launch point in terms of the given parameters. The gravitational acceleration is g.

Note: $\sin\frac{\pi}{3} = \frac{\sqrt{3}}{2}$, $\cos\frac{\pi}{3} = \frac{1}{2}$, $\sin\frac{\pi}{4} = \cos\frac{\pi}{4} = \frac{\sqrt{2}}{2}$



$x = v_0 \cos\alpha_0 t$

$y = v_0 \sin\alpha_0 t - \frac{1}{2} g t^2$

$\tan\theta = \frac{-y}{x} = \frac{\frac{1}{2} g t^2 - v_0 \sin\alpha_0 t}{v_0 \cos\alpha_0 t} = 1$ $\quad x = -y$

$v_0 \cos\alpha_0 = \frac{1}{2} g t - v_0 \sin\alpha_0$

$(\sqrt{3} + 1)\frac{v_0}{g} = t$

$d = \sqrt{x^2 + y^2} = \sqrt{x^2 + x^2} = x\sqrt{2}$

$d = \sqrt{2}\left[v_0 \cdot \frac{1}{2} \cdot \frac{v_0}{g}(\sqrt{3} + 1)\right] = \frac{v_0^2}{g}\frac{\sqrt{3}+1}{\sqrt{2}}$

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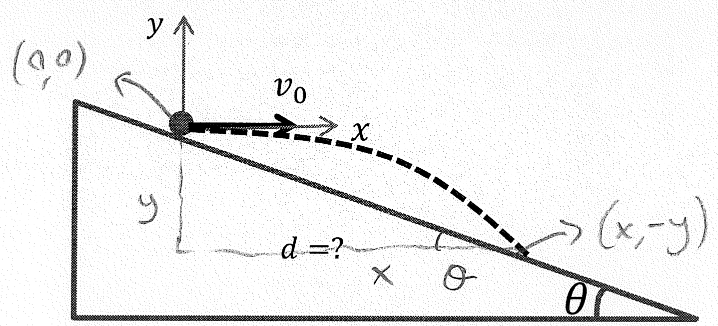
Section **Quiz 3-3** **March 2015**

Closed book. No calculators are to be used for this quiz.
Quiz duration: 10 minutes

Name: **Student ID:** **Signature:**

A projectile is launched from the origin with initial speed v_0 on an inclined surface. The launch angle with the horizontal is $\alpha_0 = 0$. The inclination angle of the surface is $\theta = \frac{\pi}{4}$. Determine the distance of the landing point from the launch point in terms of the given parameters. The gravitational acceleration is g. ($\sin\frac{\pi}{4} = \cos\frac{\pi}{4} = \frac{\sqrt{2}}{2}$)



$x = v_0 t$

$y = \frac{1}{2} g t^2$

$\tan\theta = \frac{y}{x} = \frac{\frac{1}{2} g t^2}{v_0 t} = 1 \qquad x = y$

$\frac{2v_0}{g} = t$

$d = \sqrt{x^2 + y^2} = \sqrt{x^2 + x^2} = x\sqrt{2} = v_0 \cdot \frac{2v_0}{g}\sqrt{2} = 2\sqrt{2}\,\frac{v_0^2}{g}$