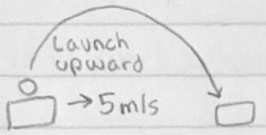
2-Dimensional Motion

PH III

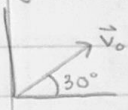
1. Projectile motion
2. Motion in a circle



$a_y = -9.8\ m/s$

$a_x = 0$

A punter kicks a football at an angle of 30° with the horizontal and at an initial velocity of 20 m/s. Where should a punt returner position himself to catch the football just before it strikes the ground?

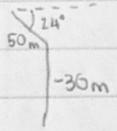


$\vec{v}_{ox} = 20\cos 30 = {}^{+}17.3\ m/s$ Assume launch and receiving levels are the same

$\vec{v}_{oy} = 20\sin 30 = {}^{+}10\ m/s$

$0 = 10 - 9.8t \quad t = 2.04s \quad 29 = 17.3t \quad t = 1.676s$

$\vec{x} = 17.3(2.04) = {}^{+}35.3m \quad \vec{y} = 10(1.676) - \frac{1}{2}(9.8)(1.676)^2 = {}^{+}3m$



$\vec{a} = {}^{+}4\ m/s^2 \quad \vec{v}_{oy} = \vec{v}_f \cos 24$

$\vec{v}_{ox} = -\vec{v}_f \sin 24$