P #30

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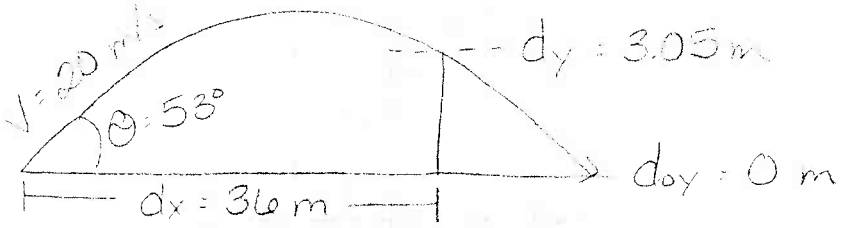
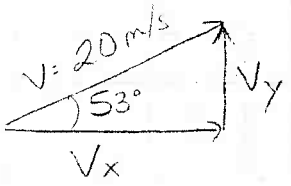
a)





$V_x = V \cdot \cos\theta$
$= (20\ m/s) \cdot \cos 53°$
$V_x = 12.0\ m/s$

$V_y = V \cdot \sin\theta$
$= (20 m/s) \cdot \sin 53$
$V_y = 16.0\ m/s$

$d_x = v_x \cdot t$ so $(36\ m) = (12.0\ m/s) \cdot t$

$t = 2.99\ sec$

$d_y = d_{oy} + V_{oy} \cdot t + \frac{1}{2} \cdot a \cdot t^2$

$= 0m + (16.0 m/s)(2.99\ sec) + \frac{1}{2}(-9.8 m/s^2)(2.99 s)^2$

$d_y = 3.93\ m$

$\Delta dy = 3.93\ m - 3.05\ m = .89\ m$

The ball clears the goal by: $\boxed{\Delta dy = .89 m}$

b) $V_{oy} = +16.0 m/s$
$a = -9.8\ m/s^2$
$t = 2.99\ sec$

$V_y = V_{oy} + a \cdot t$

$= (16.0 m/s) + (-9.8 m/s^2)(2.99\ sec)$

$V_y = -13\ m/s$

Negative indicates the football is:

$\boxed{\text{falling}}$