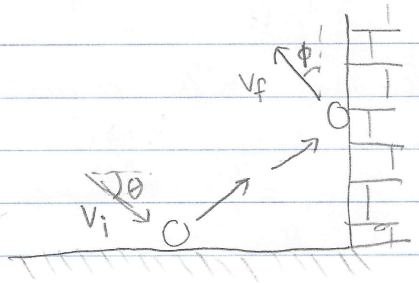
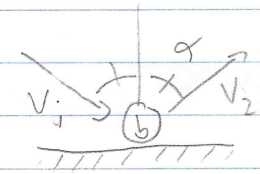
20-P-MOM-04-[illegible] 6

A tennis ball bounces off the floor and then the wall. The ball has a coefficient of restitution $e = 0.6$ with the floor and wall. The initial velocity of the ball is 2 m/s 30° below the horizontal axis. Determine the final velocity and angle.





$\alpha = 90 - \theta = 60°$

$e = \dfrac{(v_2)_2 - (v_g)_2}{(v_g)_1 - (v_i)_1}$ $\quad v_g$ = velocity of ground $= 0$

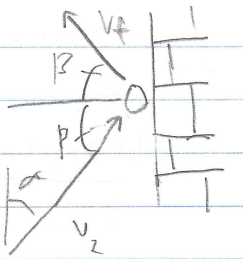
$e = \dfrac{(v_2)}{-v_i}$ $\quad v_2 = -e\,(v_i)$

collision in y-direction.

$[v_2]_y = -(0.6)(-2)\sin 30° = 0.6$ m/s

$[v_2]_x$ is conserved $= 2\cos 30° = 1.732$ m/s

$v_2 = 1.833$ m/s



$\beta = 90 - \alpha = 30°$

$e = \dfrac{v_f - (v_w)_2}{(v_w)_1 - v_i}$ $\quad v_w$ = wall $= 0$

$e = \dfrac{v_f}{-v_2}$ $\quad v_f = -e\,v_2$

collision in x-direction

$[v_f]_x = -0.6\,(v_2)\cos\beta = 0.952$ m/s

$[v_f]_y$ is conserved $= v_2 \sin\beta = 0.9165$ m/s

$v_f = 1.32$ m/s