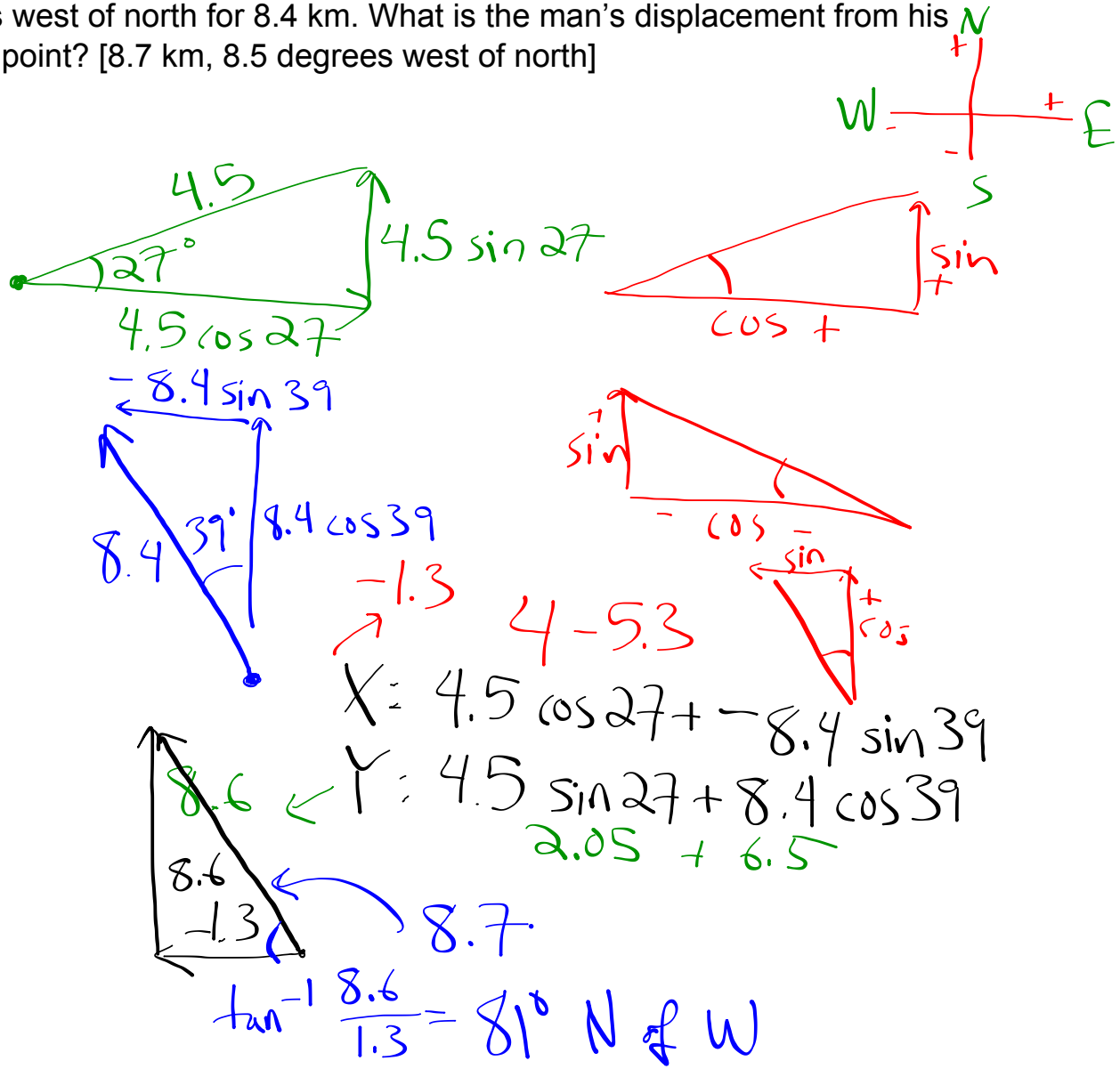
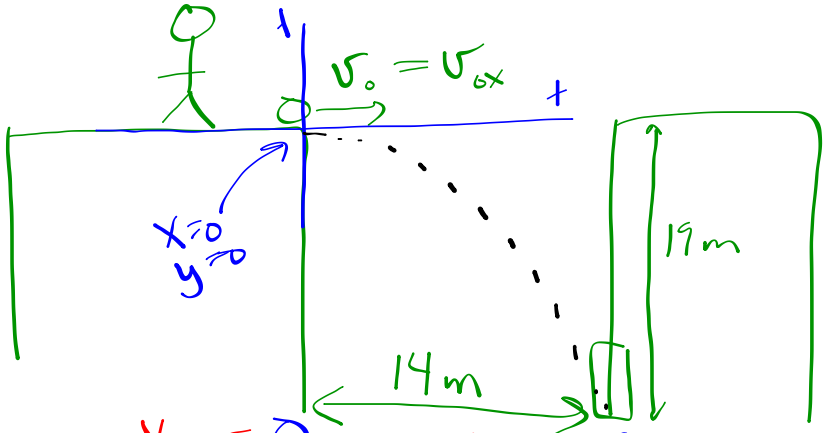
A person walks 27 degrees north of east for 4.5 km. Then, the person walks 39 degrees west of north for 8.4 km. What is the man's displacement from his starting point? [8.7 km, 8.5 degrees west of north]



Bill Melater kicks a rock off the top of his apartment building. It strikes the window of another building 14.0 m away. The window is 19.0 m below the place where Bill kicked the rock off, so how fast was it moving when it left Bill's foot? Assume a horizontal initial velocity. [7.11 m/sec]



$x_0 = 0$
$x = 14$
$v_{0x} = 7.1\ m/s$
$v_x = 7.1\ m/s$
$a_x = 0$
$t_x = 1.97s$

$y_0 = 0$
$y = -19$
$v_{0y} = 0$
$v_y =$
$a_y = -9.8\ m/s^2$
$t_y = 1.97s$

$x = x_0 + v_0 t + \frac{1}{2}at^2$

$14 = 1.97 v_0$

$v_0 = 7.1\ m/s$

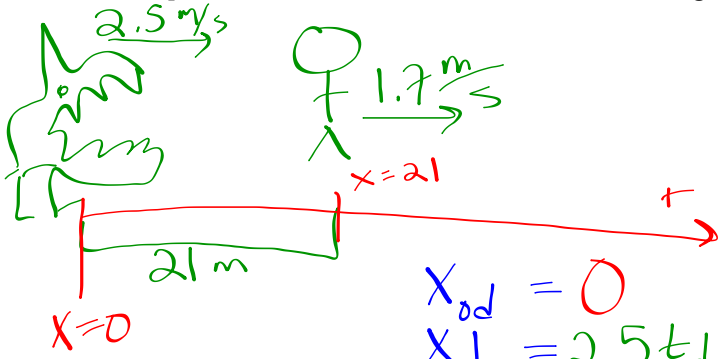
$x = x_0 + v_0 t + \frac{1}{2}at^2$

$-19 = \frac{1}{2}(-9.8)t^2$

$-19 = -4.9t^2$

$t = 1.97s$

A man jogs along at 1.70 m/sec. An attack dog, 21.0 m behind, waits for 6.00 seconds, and then takes off at 2.50 m/sec. When and where will contact be made? [45.0 sec at 97.5 m from where the dog starts]



start: $t=0$

dog starts: $t=6$

end time $= t$

$x_{od} = 0$
$x_d = 2.5t_d$
$v_{od} = 2.5\frac{m}{s}$
$v_d = 2.5\frac{m}{s}$
$a_d = 0$
$t_d = \frac{1}{2.5}x_d$ 39

$x = x_0 + v_0t + \frac{1}{2}at^2$

$x = 2.5t_d$

$x_{om} = 21$
$x_m = 21 + 1.7t_m$
$v_{om} = 1.7\frac{m}{s}$
$v_m = 1.7\frac{m}{s}$
$a_m = 0$
$t_m = \frac{x_m - 21}{1.7}$ 45

$x = x_0 + v_0t + \frac{1}{2}at^2$

$x_m = 21 + 1.7t_m$

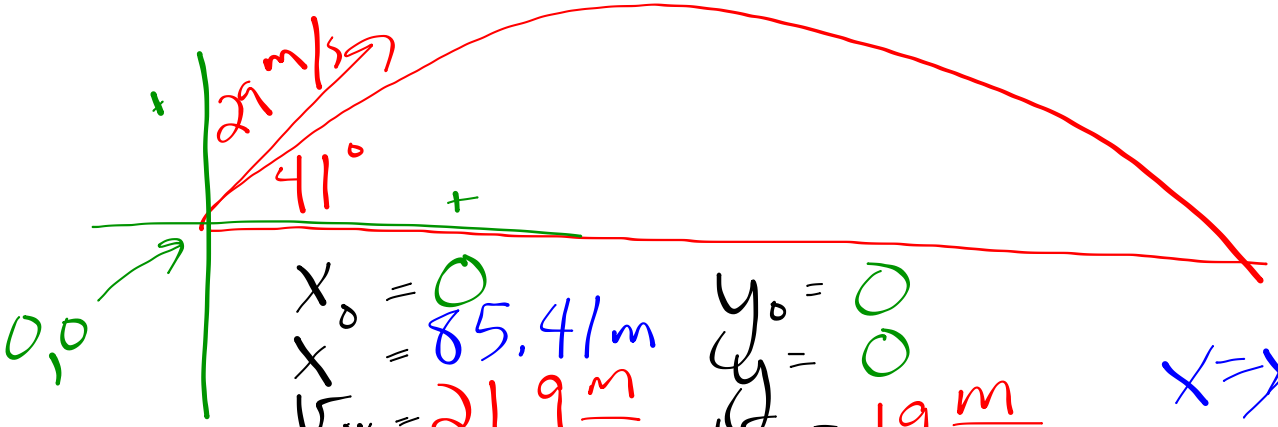
$x_d = x_m$ $2.5t_d = 21 + 1.7t_m$

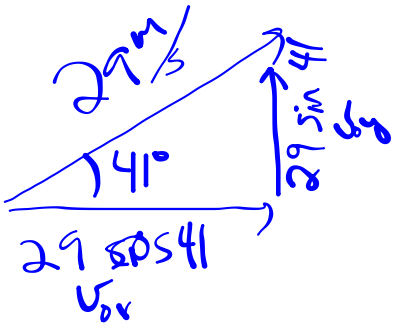
$2.5(t_m - 6) = 21 + 1.7t_m$ $t_m - 6 = t_d$

$.8t_m = 36$

$t_m = 45s$

A rock is fired from a slingshot at 29.0 m/sec, 41.0 degrees above the horizontal. How far away does it land? [85.0 meters]





$x_0 = 0$
$x = 85.41\,m$
$v_{ox} = 21.9\ \frac{m}{s}$
$v_x = 21.9\ \frac{m}{s}$
$a_x = 0$
$t_x = 3.9\,s$

$y_0 = 0$
$y = 0$
$v_{oy} = 19\ \frac{m}{s}$
$v_y =$
$a_y = -9.8\ \frac{m}{s^2}$
$t_y = 3.9\,s$

$x = x_0 + v_0 t + \frac{1}{2} a t^2$

$0 = 19t + \frac{1}{2}(-9.8)t^2$

$t(-4.9t + 19) = 0$

$t = 0 \quad t = 3.9\,s$

~~for 8.4 km. What is the man's displacement from his starting point? [8.7 km, 8.5 degr~~

3. An astronaut in space experiences the accelerations from three planets as shown below. What is the resultant acceleration acting on the astronaut? [6.36 m/sec^2, 37.5 degrees above the negative x-axis.]