Motion In One And Two Dimensions & Relativity

Book Chapter: 2, 3, 26
Book Pages: 22-46, 57-71, 807-814
Practice Problems: pp 50-53; 6, 20, 50, 68   pp76-78; 30   pp833; 8

Terms/ Ideas:
Acceleration
Free-fall
Frame of reference
Projectile
Free Body Diagram
Time dilation, length contraction and mass increase (Relativity).

Equations:
$v = v_o + at$
$d = v_o t + 1/2at^2$
$v^2 - v_o{}^2 = 2ad$
a=g in free-fall

$$x = \sqrt{1 - \frac{v^2}{c^2}}$$

$$m = \frac{m_0}{x}$$

$$t = t_0 x$$

$$l = l_0 x$$

$$Ft = \Delta p = mv = mv_o$$

A ball of mass 0.500 Kg, initially at rest, is kicked directly toward a fence from a point 22.0 meters away. The velocity of the ball as it leaves the kickers foot is 30.00 meters per second at an angle of 27.0^o above the horizontal. The top of the fence is 2.65 meters high. The kicker's foot is in contact with the ball for .05 seconds. The ball hits nothing while in flight and air resistance is negligible.

1) Determine the time it takes for the ball to reach the plane of the fence.

2) Will the ball hit the fence? How close to the top of the fence will the ball either pass or hit?

3) What is the impulse of the foot on the ball?

4) Determine the magnitude of the average force on the ball during the kick.

5) Draw a free body diagram, showing all forces on the ball at the moment of impact.