69942, Physics / Other

Question A tennis ball is dropped from bridge and 1.0 seconds later a golf ball is thrown downward with a speed of 15m/s. a) How much time elapses before the golf ball catches up with the tennis ball? b) How far below the point of release does the golf ball catch up with the tennis ball?

Solution Lets write down equation of motion for both balls. For tenis

$$s(t) = gt^2/2$$

For golf:

$$s(t) = v_0(t-1) + g(t-1)^2/2$$

where $v_0 = 15$ m/s.
Lets find when golf ball catches up with the tennis ball (time t_1):

$$gt_1^2/2 = v_0 t_1 - v_0 + gt_1^2/2 - gt_1 + g/2$$

$$t_1(v_0 - g) + g/2 - v_0 = 0$$

From this we find that

$$t_1 = \frac{v_0 - g/2}{v_0 - g} \approx 1.94\,s$$

And now, we can find how far below the point of release does the golf ball catch up with the tennis ball:

$$s_1 = gt_1^2/2 = 9.8 \cdot 1.94^2/2 \approx 18.4\,m$$