2021 F=ma Exam: Problem 2

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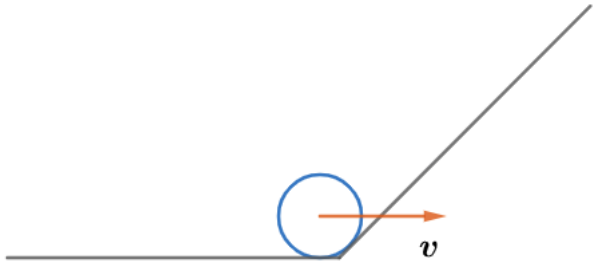
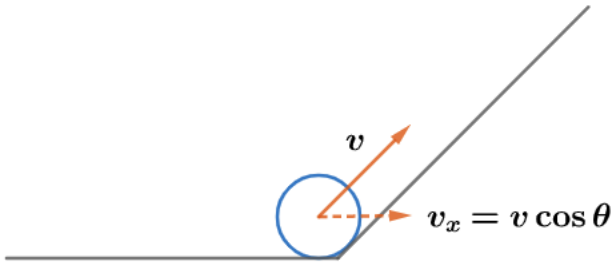
Using our results from the previous problem, the horizontal velocity v_x is the same as the velocity v when the ball is on the ground. On the incline, since the ball has constant acceleration, in particular the x-component of acceleration a_x is constant (v_x decreases uniformly).



Finally, at the transition when going up, v_x drops from v to $v\cos\theta$ to conserve energy (vice versa when coming down),



which we can idealize as occurring instantaneously. Thus, the horizontal velocity over time is shown in graph $\boxed{E}$.