Two smooth tracks of equal length have "bumps"—A up and B down, both of the same curvature. If two balls start simultaneously with the same initial speed, the ball to complete the journey first is along:

a) Track A.  b) Track B.  c) ... both take the same time.

If the initial speed = 2 m/s, and the speed of the ball at the bottom of the curve on Track B is 3 m/s, then the speed of the ball at the top of the curve on Track A is:

d) 1 m/s.  e) > 1 m/s.  f) < 1 m/s.
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Answers: b and f
Although both balls have the same speed on the level parts of the tracks, the speeds along the curved parts differ. The speed of the ball everywhere along curve B is greater than the initial speed, whereas everywhere along curve A it is less. So the ball on Track B finishes first.
Does the gain in speed at B’s bottom equal the loss at A’s top? No! Speed isn’t conserved: energy is. The loss in kinetic energy at the top of A will be equal to the gain in kinetic energy at the bottom of B—if there is enough energy to begin with.
There isn’t because the initial KE \( \frac{1}{2} m v^2 \) is less than the gain in KE at the bottom of B \( \frac{1}{2} m (v_B^2 - v_A^2) \). At 2 m/s, the ball will not even make it to the top of A’s curve.