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### 3. Application to particle physics

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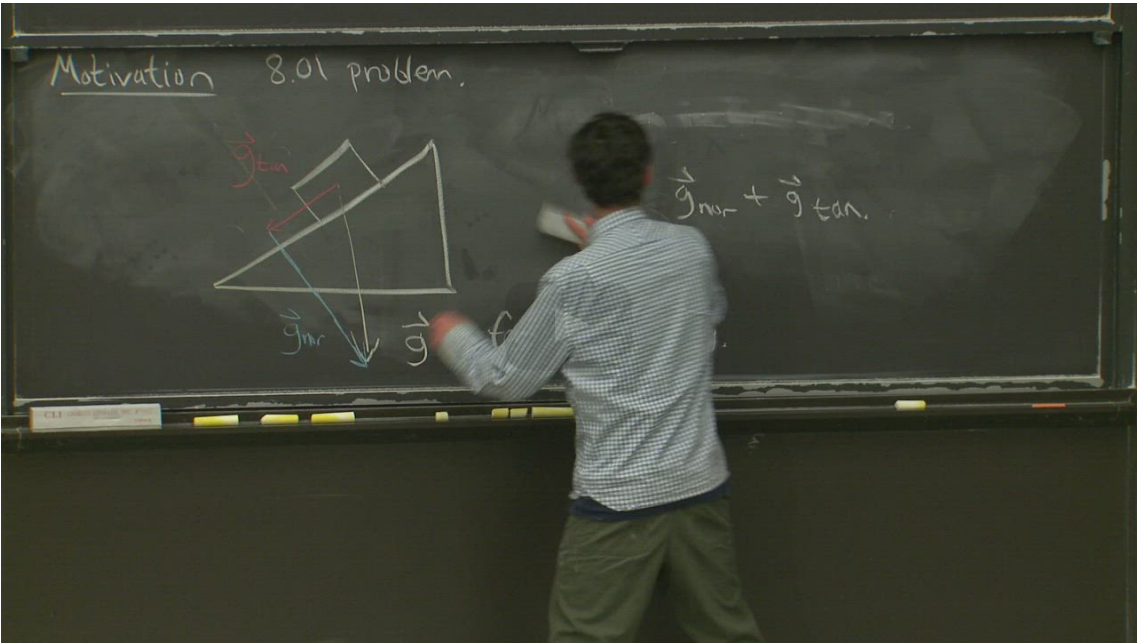
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A particle bouncing off a wall

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PROFESSOR: So let me pose for you one last problem, which you guys are going to solve in recitation on Monday by using these ideas. It might also be an 8.01 problem or at least a physics problem. So over here, I have a wall. And it's a line.



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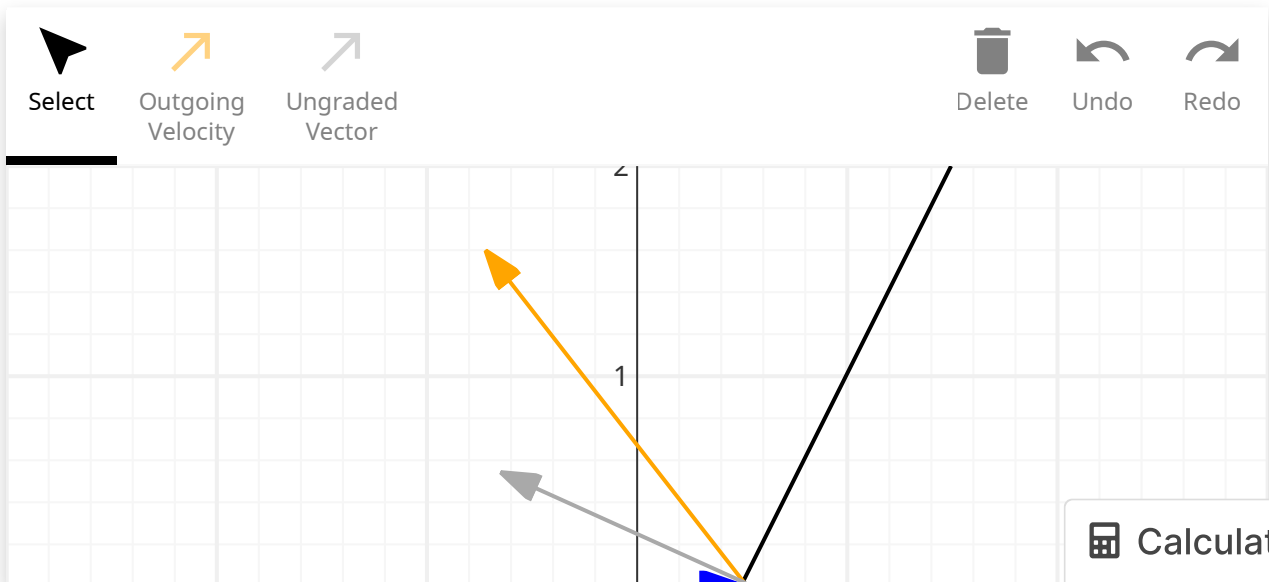
Sketch the velocity

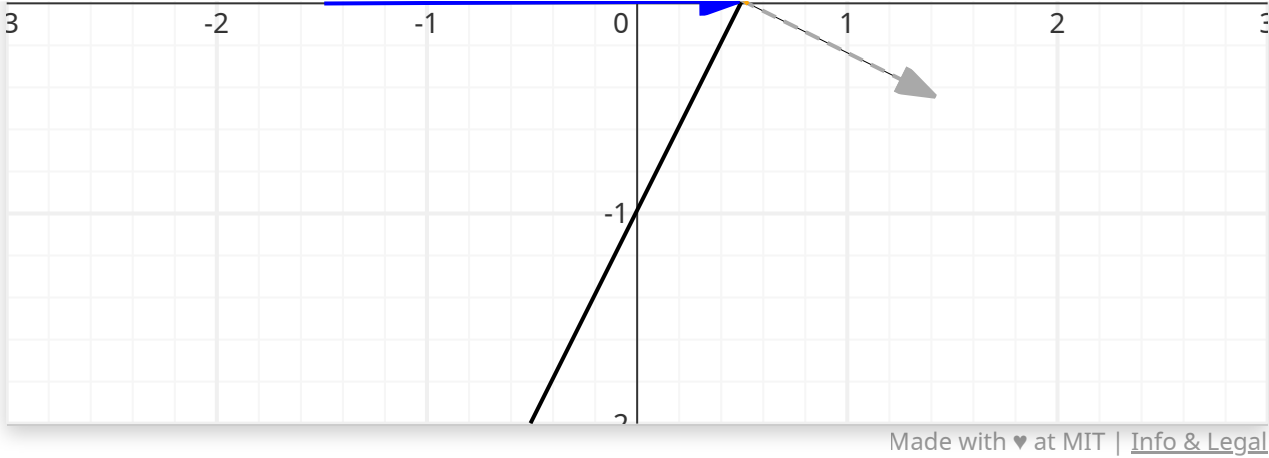
1.0/1 point (graded)  
Suppose that the line  $L$  given by  $2x - y = 1$  from Problem 2 is a wall. A particle approaches the wall moving along the  $x$ -axis and bounces off of it.

Before the particle bounces off the wall, it has velocity  $\vec{v} = \langle 2, 0 \rangle$ . Sketch the velocity after the particle bounces off the wall. The velocity after has the same magnitude as before, and the angle of incidence equals the angle of reflection.

In the picture, the incoming arrow is the blue vector  $\langle 2, 0 \rangle$ . We have drawn a dotted vector normal to the wall and the wall itself. We want you to draw the outgoing arrow, which is the outgoing velocity of the particle.

Hint: Find the component of  $\vec{v}$  normal to the wall and the component of  $\vec{v}$  tangent to the wall, and relate them to the outgoing velocity.





**Answer:** See solution.

✓  
Well done

**Solution:**

We start by finding the components of the incoming vector that are tangent and normal to the wall (the line). The reflected line is the sum of the negative of the normal component with the tangent component.

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**i** Answers are displayed within the problem

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3. Application to particle physics

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< Previous

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