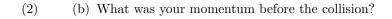Please answer the questions below to the best of your ability either in the space provided. Everything should be scanned or photographed and submitted through gradescope.com. Consider rating how well the question matched the objective in the bottom left so I can continue to improve these questions.

> **Objective:** *I can transform between position, velocity, and momentum vectors and relate them to physical observations.*

1. In your haste to get to your 8am physics class, you run into someone going the other way coming up the Collins steps. Approximate your mass to be $65\,\mathrm{kg}$ and assume your initial velocity was $\vec{\mathbf{v}}_i = \langle 5, 1, 5 \rangle\,\mathrm{m/s}$. This is a relatively slow speed so you can use the simple form for momentum.

(2)   (a) How fast were you traveling before the collision? (What was your speed?)

(2)   (b) What was your momentum before the collision?

(2)   (c) After the collision, you slowed and were traveling with velocity $\vec{\mathbf{v}}_{after} = \langle 3, 0.25, 2 \rangle\,\mathrm{m/s}$. What is your momentum after the collision?

(3)   (d) What is the magnitude of your change in momentum?

(2)   (e) What unit vector points in the direction of your change of momentum?