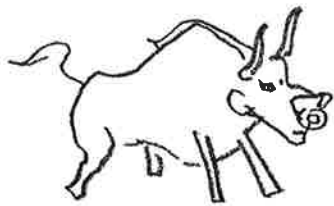


Ex 21.2

Bull/Train collision



- a) By Newton's 3<sup>rd</sup> law,  $F_{\text{Bull}} = -F_{\text{Train}}$
- b) The forces act for the same duration,  $\Delta t$ .
- b) They both suffer the same change in momentum,  $\Delta p$ , since  $\Delta p \propto F$ , by Newton's 2<sup>nd</sup> law.
- c) Because of the great difference in mass, the train suffers a much smaller change in velocity than the bull does. Thus, Newton's laws provide a coherent, sensible explanation.
- d) Both observers, one riding on the train & one riding on the bull would agree on the forces, insofar as they agree on the changes in momentum and the time of the collision.