

NEWTON'S 2ND LAW

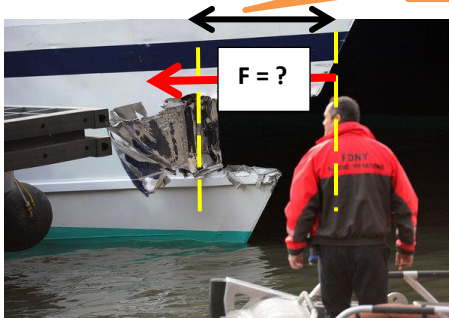
Unit 6 & 7 Dr. John P. Cise, Professor of Physics,

Austin Community College, 1212 Rio Grande St., Austin Tx 78701 jpcise@austincc.edu & NYTimes Thursday January 10, 2013 by Matt Flegenheimer and Colin Moynihan

Several Dozen Injured in Ferry Crash in Lower Manhattan



8 ft.



One by one, the passengers shuffled toward the exits — bags in hand, music in their ears — gathering in a neat crowd to step off their New Jersey commuter ferry and into the frosty Lower Manhattan morning.

Multimedia



Graphic

The Scene of an Accident at Pier 11

The boat approached its dock just before 8:45 a.m. on Wednesday, churning toward Pier 11, at South Street and Gouverneur Lane. Right on time. Or perhaps a hair too early. Suddenly, the vessel appeared to hit a wall. Steve Mann, 39, an animator from Rumson, N.J., had been dozing on the second level, when the boat seemed to go from “60 to zero.” He collected himself, groggily, about 10 feet from where he had been sitting.

The cause of Wednesday’s accident was not immediately clear, **though officials said the ferry had been traveling at (((over 10 miles per hour))) just before the crash**

INTRODUCTION: This 455 ton ferry was initially moving at over 10 mph(as stated below). We will take the initial velocity prior to crash to be 13 mph. As you can see in the graphic the ferry stopped in about 8 feet.

INITIAL HINTS: 60 MPH = 88 ft/s , $x = v_{ave} t$, $v = v_o + at$, $v^2 = v_o^2 + 2ax$
 $F_{net} = ma$, $g = 32 \text{ ft/s}^2$, $W = mg$, 2000 lb = 1 ton

QUESTIONS: (a) Convert 13 mph to ft/s? (b) Find deceleration a of crash in ft/s^2 ? (c) Find deceleration in terms of g ? (d) Convert ferry weight in tons into pounds? (e) Find the mass(in slugs) of the ferry? (e) Find force(F) exerted on ferry by the pier it crashed into? (f) Find force the ferry exerted on the pier? (g) Find force in Tons?

ANSWERS: (a) ~ 19.07 ft/s (b) -22.72 ft/s^2 , (c) 2.32 g , (d) ~ 910,000 lb., (e) ~ 28,437.5 slugs, (f) ~646,100 lb., (g)~ 323.05 Tons

EXTRA CREDIT QUESTION(NOT NEEDED TO BE DONE)....JUST EXTRA:
 Solve for the force exerted on the ferry using energy conservation concepts($Fx = \Delta KE + \Delta PE$) where ΔKE = change in kinetic energy, ΔPE = change in potential energy, Fx = force X displacement