

NORTHERN ILLINOIS UNIVERSITY

PHYSICS DEPARTMENT

Physics 210 – Mechanics & Heat

Spring 2022

Problem Set #7

Problem Set Due: Thurs., March 24, 2022

Read OpenStax: Chapter 7.1-7.6, Lecture Notes #7

Show explicitly all your work for full credit.

- | | |
|------------------------------|-----------------------------------|
| 1. Expert TA: c7.1.1 | <i>conceptual problem—explain</i> |
| 2. Expert TA: c7.1.2 | <i>conceptual problem—explain</i> |
| 3. Expert TA: c7.1.3 | <i>conceptual problem—explain</i> |
| 4. Expert TA: 7.1.1 | show calculation and figure |
| 5. Expert TA: 7.1.13 | show calculation and figure |
| 6. Expert TA: 7.3.2 | show calculation and figure |
| 7. Expert TA: 7.4.2 | show calculation and figure |
| 8. Expert TA: 7.4.3 | show calculation and figure |
| 9. Expert TA: 7.4.8 | show calculation and figure |
| 10. Expert TA: 7.4.39 | show calculation and figure |

The following problems are makeup problems for Problem Set #3. They are for students who did not know about the extra “my problems”. Do not do the following problems if you have already done the extra “my problems” (problems # 1, 2, 3) in Problem Set #3.

Staple (Problems #11, #12, #13) together separately from (Expert TA problems)

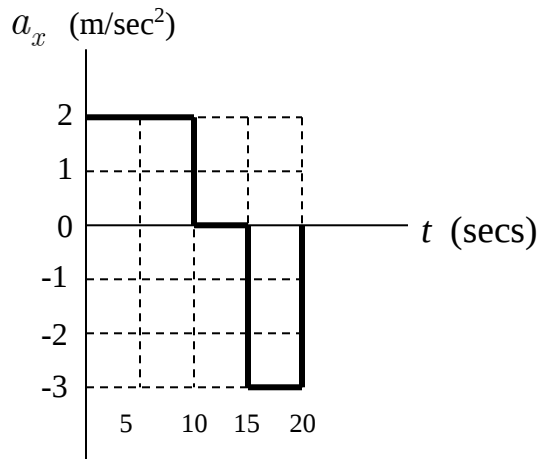
**Makeup problems for Problem Set #3:
Problem # 11, 12, 13 are on the next pages**

11. A stone is thrown straight down a cliff with an initial speed of 8.0 m/sec from a height of 30.0 m. After what time interval does the stone strike the ground?
(1.7892)

12. Katie Cool buys a fancy Jaguar car that can accelerate at the rate of 4.9 m/sec². She decides to test the car by racing with another speedster, Steve Speedy. Both start from rest, but experienced Steve leaves the starting line 1.0 sec before Katie. Steve moves with a constant acceleration of 3.5 m/sec² and Katie maintains an acceleration of 4.9 m/sec². Find: (5.46, 73.0, 22.6 & 26.7)

- (a) the time at which Katie overtakes Steve
- (b) the distance she travels before she catches him
- (c) the speeds of both cars at the instant she overtakes him

13.



A particle starts from rest and accelerates as shown in the figure to the left. Determine: (a) the particle's speed at $t = 10.0$ sec, (b) the speed at $t = 20.0$ sec, (c) the distance traveled in the first 20.0 sec, (d) plot the velocity versus time graph for this problem, (e) plot the position versus time graph for this problem.

(Part (c): total distance = 262.5)