

## Physics 10154 - Exam #1C

Partial credit will be given provided you show all work and are solving parts of the problem correctly. Points will be deducted if you don't show your work (or if some parts are incorrect) even if you get the right answer. Clearly indicate your answer with a circle or box and remember to include correct units and significant figures.

1. (30 pts) A boat race consists of three legs, defined by the displacement vectors A, B and C. The finish line is the same as the starting line, so the sum of the vectors A, B and C is zero. Vector A is 3.15 km in a direction  $40.0^\circ$  North of East. Vector B is 5.22 km in a direction  $35.0^\circ$  North of West. What is the magnitude and direction of vector C?

2. (35 pts) A diver springs upward with an initial speed of 2.55 m/s from a board that is 3.20 meters above the water.

- (a) Find the velocity (magnitude and direction) with which the diver strikes the water.
- (b) If a stone is thrown downward with a speed of 2.55 m/s at the same instant the diver jumps upward, how much time elapses between the time the stone hits the water and the time the diver hits the water?

3. (35 pts) A race car starts from rest and accelerates up a 38.0 meter long ramp at a rate of  $22.0 \text{ m/s}^2$ . The ramp is elevated  $17.0^\circ$  above the horizontal. Upon leaving the ramp, the car is in free fall.

- a) What is the magnitude and direction of the velocity of the car when it reaches its maximum height above ground level?
- b) What is the maximum height above ground level achieved by the car?