

Name: \_\_\_\_\_

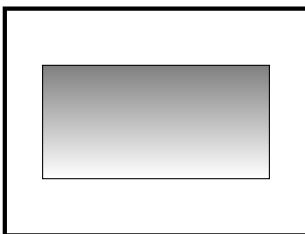
4-digit code: \_\_\_\_\_

- Write your name and the last 4 digits of your SSN in the space provided above.
- The test has four (4) pages, including this one.
- You have fifty (50) minutes to complete the exam.
- **There are four problems in page 2: two are on *related rates*, and two on *optimization* (not necessarily in that order!). Chose one of each: do the problem on related rates on page 3, and the problem on optimization of page 4.**
- You must show sufficient work to justify all answers unless otherwise stated in the problem. Correct answers with inconsistent work may not be given credit.
- Credit for each problem is given in parentheses at the right of the problem number.
- No books, notes or calculators may be used on this test.

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Page	Max. points	Your points
3	50	
4	50	
<b>Total</b>	100	

**Problem 1** (50 pts). The top and bottom margins of a poster are each 12 cm and the side margins are each 8 cm. If the area of the printed material on the poster is fixed at  $1536 \text{ cm}^2$ , find the dimensions of the poster with the smallest area.

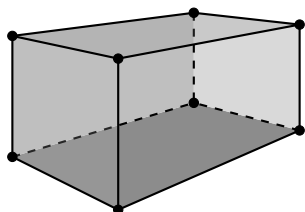


**Problem 2** (50 pts). A street light is mounted at the top of a 15-ft-tall pole. A man 6 ft tall walks away from the pole with a speed of 7 ft/s along a straight path. How fast is the tip of his shadow moving when he is 30 ft from the pole? (leave the answer as a fraction)



**Problem 3** (50 pts). At noon, ship  $A$  is 70 km west of ship  $B$ . Ship  $A$  is sailing south at 40 km/h and ship  $B$  is sailing north at 20 km/h. How fast is the distance between the ships changing at 4:00 PM? (leave the answer as a fraction)

**Problem 4** (50 pts). A box with square base and open top must have a volume of  $4,000 \text{ cm}^3$ . Find the dimensions of the box that minimize the amount of material used.



**Related Rates**

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**Optimization**