

Word Problem Practice

1. A boat leaves a dock at 1:00PM and travels due north at a speed of 20km/h. Another boat has been heading due west at 15 km/h and reaches the same dock at 2:00PM. At what time were the two boats closest together?
2. A fence 8 ft tall runs parallel to the tall building at a distance of 4 ft from the building. What is the length of the shortest ladder that will reach from the ground over the fence to the wall of the building?
3. A manufacturer has been selling 1000 widgets a week at \$450 each. A market survey indicated that for each \$20 rebate offered to the buyer, the number of sets sold will increase by 100 per week. How large a rebate should the company offer the buyer in order to maximize its revenue?
4. A widget manufacture has fixed cost of \$68,000 and another \$150 for each additional widget produced. Find the cost function and then find out how many widgets should be sold to maximize profit if the revenue function is $q \left[\frac{-1}{100}(q - 1000) + 450 \right]$, where q is the number of widgets produced/sold.
5. Find the point on the line $6x + y = 9$ that is closest to the point $(-3, 1)$.
6. A piece of wire 10 m long is cut into two pieces. One piece is bent into a square and the other is bent into a circle. How should the wire be cut so that the total area enclosed is a maximum? minimum?
7. Graph $y = \frac{x}{x^2-16}$ without using a graphing device. Make sure to identify the coordinates of any critical points.
8. A hockey team plays in an arena with a seating capacity of 15,000 spectators. With the ticket price set at \$12, average attendance at a game has been 11,000. A market survey indicates that for each dollar the ticket price is lowered, average attendance will increase by 1000. How should the owners of the team set the ticket price to maximize their revenue from ticket sales?
9. A metal storage tank with volume V is to be constructed the shape of a right circular cylinder surmounted by a hemisphere. What dimensions will require the least amount of metal?
10. A truck has a minimum speed of 9 mph in high gear. When traveling x mph, the truck burns diesel fuel at the rate of

$$0.003935 \left(\frac{675}{x} + x \right) \frac{\text{gal}}{\text{mile}}$$

Assume that the truck can not be driven over 63 mph and that diesel fuel costs \$2.84 a gallon. What speed should the truck be driven to minimize the cost of fuel used for a 500 mile trip?

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Assume that the truck can not be driven over 63 mph, that diesel fuel costs \$2.84 a gallon, and that the driver is paid \$12 an hour. Find the speed that will minimize the cost of a 500 mile trip.

12. A commercial cattle ranch currently allows 20 steers per acre of grazing land; on the average its steers weight 2000 lb at market. Estimates by the Agriculture Department indicate that the average market weight per steer will be reduced by 50 lbs for each additional steer added per acre of grazing land. How many steers per acre should be allowed in order for the ranch to get the largest possible total market wight for its cattle?
13. Find an equation of the line through the point (3,5) that cuts off the least area from the first quadrant.
14. At which points on the curve $y = 1 + 40x^3 - 3x^5$, does the tangent line have the largest slope?