3.3b More Optimization (*Taken from the Nelson Text: Pg. 152 – 154*)

4. The operating cost, C, in dollars per hour, for an airplane cruising at a height of h metres and an air speed of 200 km/h is given by $C = 4000 + \frac{h}{15} + \frac{15\,000\,000}{h}$ for the domain $1000 \leq h \leq 20\,000$. Determine the height at which the operating cost is at a minimum, and find the operating cost per hour at this height.

6. A real estate office manages 50 apartments in a downtown building. When the rent is \$900 per month, all the units are occupied. For every \$25 increase in rent, one unit becomes vacant. On average, all units require \$75 in maintenance and repairs each month. How much rent should the real estate office charge to maximize profits?

8. The fuel cost per hour for running a ship is approximately one half the cube of the speed (measured in knots) plus additional fixed costs of \$216 per hour. Find the most economical speed to run the ship for a 500 M (nautical mile) trip. *Note:* Assume that there are no major disturbances, such as heavy tides or stormy seas.

9. A 20 000 m^3 rectangular cistern is to be made from reinforced concrete such that the interior length will be twice the height. If the cost is \$40/m^2 for the base, \$100/m^2 for the side walls, and \$200/m^2 for the roof, find the interior dimensions (to one decimal place) that will keep the cost to a minimum. To protect the water table, the building code specifies that no excavation can be more than 22 m deep. It also specifies that all cisterns must be at least 1 m deep.

15. Through market research, a computer manufacturer found that x thousand units of its new laptop will sell at a price of $2000 - 5x$ dollars per unit. The cost, C, in dollars to produce this many units is $C(x) = 15\,000\,000 + 1\,800\,000x + 75x^2$. Determine the level of sales that will maximize profit.

Answers

4. \$6000/h when plane is flying at 15 000 m **6.** \$1100 or \$1125 **8.** 6 nautical miles/h

9. 20.4 m by 40.8 m by 24.0 m **15.** 19 704 units