Optimal Word Problems

1. A model rocket is launched straight up, with an initial velocity of 150 m/s. The height of the rocket can be modelled by $h = -5t^2 + 150t$, where h is the height in metres and t is the elapsed time in seconds. What is the maximum height reached by the rocket?

2. A movie theatre can accommodate a maximum of 450 moviegoers per day. The theatre operators have determined that the profit per day, P, is related to the ticket price, t, by $P = -30t^2 + 450t - 790$. What ticket price will maximize the daily profit?

3. The world production of gold from 1970 to 1990 can be modelled by $G = 5t^2 - 76t + 1492$, where G is tonnes of gold and t is years since 1970 ($t = 0$ for 1970, $t = 1$ for 1971, and so on).
   a) During this period, when was the minimum amount of gold mined?
   b) What was the least amount of gold mined in one year?
   c) How much gold was mined in 1985?

4. A city transit system carries an average of 9450 people per day on its buses, at a fare of $1.75 each. The city wants to maximize the transit system's revenue by increasing the fare. A survey shows that the number of riders will decrease by 210 for every $0.05 increase in the fare. What fare will result in the greatest revenue? How many daily riders will they lose at this new fare?