

## MATH 122 WORKSHEET 9

Show all work for full credit.

1. After a great deal of experimentation, two Atlantic Institute of Technology senior physics majors determine that when a bottle of French champagne is shaken several times, held upright, and uncorked, its cork travels according to

$$s(t) = -16t^2 + 64t + 3,$$

where  $s$  is its height (in feet) above the ground  $t$  seconds after being released. How high will it go? Prove your answer.

2. Find the quantity  $q$  that maximizes profit if the total revenue,  $R(q)$ , and the total cost,  $C(q)$ , are given in dollars by

$$R(q) = 7q - 0.02q^2$$

$$C(q) = 40 + 2.2q.$$

What is the maximum profit? Prove your answer.

3. A commuter train carries 600 passengers each day from a suburb to a city. The fare to ride the train is \$1.75 per person. Market research reveals that 40 fewer people would ride the train for each \$0.05 increase in the fare, 40 more for each \$0.05 decrease. What fare would be charged to get the largest possible revenue? How many people would ride each day at this price? Prove your answer.

4. Suppose that the cost of publishing a small book is \$10000 to set up the (annual) press run plus \$8 for each book printed. The publisher's price function is

$$p(q) = 20 - \frac{q}{1000},$$

where  $p$  is the price at which exactly  $q$  books will be sold. How many copies should be printed, and what should be the selling price of each copy, to maximize the year's profit on this book? Prove your answer.

5. Use sum approximations to estimate  $\int_5^{53} f(x)dx$ . What values of  $n$  and  $\Delta x$  did you use?

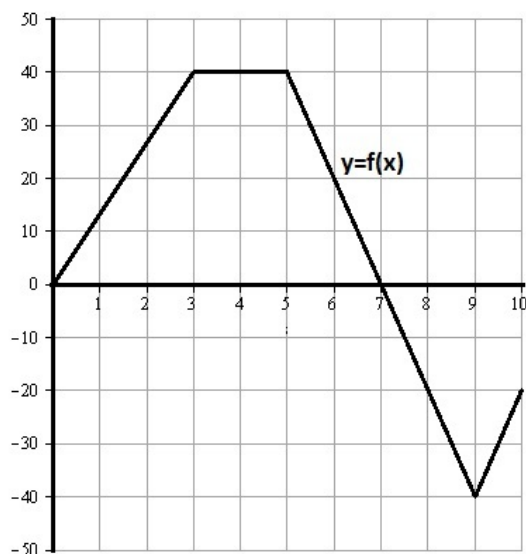
x	5	13	21	29	37	45	53
f(x)	15	20	30	35	55	70	79

6. Use sum approximations with  $n = 5$  rectangles to estimate

$$\int_6^{20} (3x - 20)^2 dx.$$

Then use your calculator to evaluate integral and check the accuracy of your estimate.

7. The graph of  $f(x)$  is shown. Evaluate each integral by interpreting it in terms of areas.



$$\int_3^{10} f(x) dx =$$

$$\int_0^4 f(x) dx =$$

$$\int_7^{10} f(x) dx =$$