

Math 122 Worksheet: Sections 1.3-1.4

Instructions: Answer all questions. Show all work and justify all your answers in **complete sentences**. Unless otherwise specified, **include the appropriate units in your answers** whenever units are included in the problem statement.

1 Section 1.3

Problem 1) Find the average rate of change of the following functions on the given intervals.

- (a) $f(x) = 2x^2$ between $x = 1$ and $x = 3$.
- (b) $f(x) = 3x^2 + 4$ between $x = -2$ and $x = 1$.

Problem 2) When a deposit of \$1000 is made into an account paying 2% interest, compounded annually, the balance is $B = 1000(1.02)^t$. Find the average rate of change in the balance between $t = 0$ and $t = 5$. Give units and interpret your answer in terms of the balance in the account.

Problem 3) Find the relative change.

- (a) B changes from 12,000 to 15,000.
- (b) S changes from 400 to 450.
- (c) W changes from 0.3 to 0.05.
- (d) R changes from 50 to 47.

Problem 4) Which relative change is bigger in magnitude? Justify your answer.

- (a) The change in the Dow Jones average from 164.6 to 77.9 in 1931; the change in the Dow Jones average from 13,261.8 to 8776.4 in 2008.
- (b) The change in the US population from 5.2 million to 7.2 million from 1800 to 1810; the change in the US population from 151.3 million to 179.3 million from 1950 to 1960.
- (c) An increase in class size from 5 to 10; an increase in class size from 30 to 50.

2 Section 1.4

Problem 5) A company has cost and revenue functions, in dollars, $C(q) = 6000 + 10q$ and $R(q) = 12q$.

- (a) Find the cost and revenue if the company produces 500 units. Does the company make a profit? What about 5000 units?
- (b) Find the break-even point.

Problem 6) The demand curve for a quantity q of a product is $q = 5500 - 100p$, where p is the price in dollars. Interpret the 5500 and 100 in terms of demand. Give units.

Problem 7) A company that makes Adirondack chairs has fixed costs of \$5000 and variable costs of \$30 per chair. The company sells the chairs for \$50 each.

- (a) Find formulas for the cost and revenue functions.
- (b) Find the marginal cost and marginal revenue.
- (c) Graph the cost and revenue functions on the same axes.
- (d) Find the break-even point algebraically (**justify your work**) and graphically.

Problem 8) The demand curve for a product is given by $Q(p) = 120,000 - 500p$, and the supply curve is given by $S(p) = 1000p$ for $0 \leq p \leq 120,000$. Here, the price p is in dollars.

- (a) At a price of \$100, what quantity are consumers willing to buy? What quantity are producers willing to supply? Will the market push prices up or down? Justify your answer.
- (b) Find the equilibrium price and quantity. Does your answer in part (a) support the observation that market forces tend to push prices closer to the equilibrium price?

Problem 9) The demand and supply curves for a product are given in terms of the price, p , as follows:

$$Q(p) = 2500 - 20p \quad \text{and} \quad S(p) = 10p - 500.$$

- (a) Find the equilibrium price and quantity. Represent your answers on a graph.
- (b) A specific tax of \$6 is imposed on the suppliers. Find the new equilibrium price and quantity. Represent your answers on the graph.
- (c) In equilibrium, how much of the tax is paid by the consumers and how much is paid by the suppliers?
- (d) What is the total tax revenue received by the government?