

Sols

Math 122: Sections 1.2-1.4 Practice

Section 1.2 Linear Functions

1. Columbia's population was 131,805 people in 2013 and is growing by 950 people per year.

(a) Give a formula for the city's population, P , as a function of years, t , since 2013.

(b) Use your formula to predict the population in 2020.

(c) When will the population exceed 200,000?

$$(a) P = 131805 + 950t$$

$$(b) t = 7, P = 131805 + 950(7) = 138455 \text{ people}$$

$$(c) P = 200,000, 200000 = 131805 + 950t$$

$$68195 = 950t$$

$$t \approx 71.8$$

$$2013 + 71.8 = 2084.8$$

So the population will exceed 200,000 in the year 2084.

2. Which of the following tables does not represent a linear function?

t	15	20	25	30
s	63	73	83	93

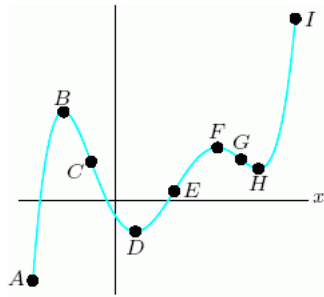
u	1	2	3	4
w	3	6	12	20

One way to see this is to check the slope:

$$1 \quad m_1 = \frac{6-3}{2-1} = 3, m_2 = \frac{12-6}{3-2} = 6$$

Section 1.3 Average Rate of Change

3. Consider the following graph:



(a) Identify the intervals on which the graph is both increasing and concave down.

(b) Identify the intervals on which the graph is both decreasing and concave down.

(a) AB, EF (b) BC, FG

4. The following table shows the world bicycle production in millions.

Year	1950	1960	1970	1980	1990	2000
Bicycles	11	20	36	62	92	101

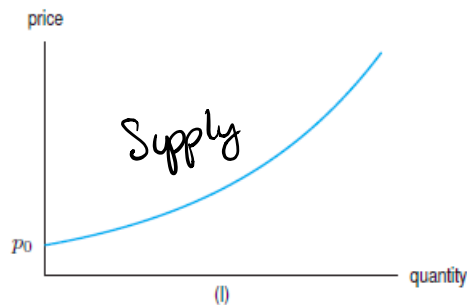
Find the average rate of change in bicycle production between 1970 and 2000.
Give units and interpret your answer in terms of bicycle production.

$$\text{Avg roc} : \frac{101 - 36}{2000 - 1970} \approx 2.17 \text{ million bicycles per year}$$

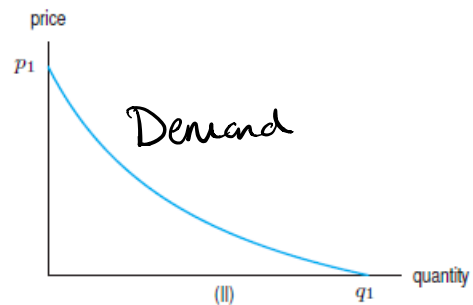
This means the production of bicycles has increased on average by 2.17 million bicycles per year between 1970 and 2000.

Section 1.4 Applications to Economics

5. Which of the following graphs represents a supply curve and which represents a demand curve?



As price increases, manufacturers are willing to produce more



As price decreases, consumers are willing to purchase more

6. A company produces and sells shirts. The fixed cost is \$7,000 and it costs \$5 to produce one shirt. Shirts are sold for \$12 each.

(a) Find the cost and revenue functions in terms of the quantity of shirts, q .

(b) The company is considering changing the selling price of the shirts. The demand curve is given by $q = 2000 - 40p$, where p is the price in dollars and q is the number of shirts. What quantity is sold at the current price of \$12? What profit is realized at the price of \$12?

$$(a) C(q) = 7000 + 5q \quad R(q) = 12q$$

$$(b) q = 2000 - 40(12) = 1520$$

$$\pi(q) = R(q) - C(q) = 12q - (7000 + 5q) = 7q - 7000$$

$$\pi(1520) = 7(1520) - 7000 = \$8,640$$