MS 120 In-class Problems

September 4, 2025

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Chapter R Section R1.2

1.2.001 Use the values in the following table.

x	-6	-1	0	3	4.2	9	12	14	15	22
y	0	0	1	5	9	12	38	22	22	70

1. Explain why the table defines y as a function of x.

   ◯ For each value of y there are multiple values for x.
   ◯ For each value of y there is only one x.
   ◯ For each value of x there are multiple values for y.
   ◯ For each value of x there is only one y.
   ◯ For some values of y there are multiple values for x.

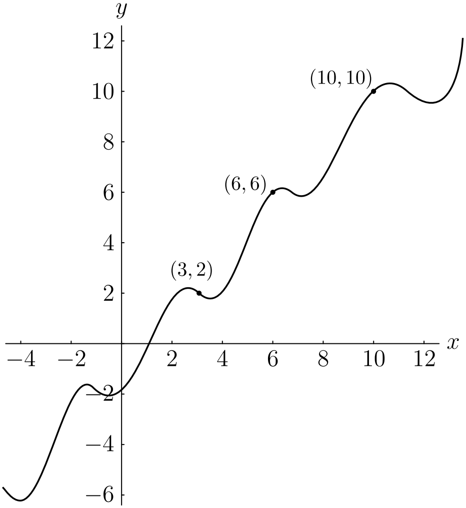
2. State the domain and range of this function.

   domain:
   range:

3. If the table expresses $y = f(x)$, find $f(0)$ and $f(12)$. (If the table does not express $y = f(x)$, enter DNE.)

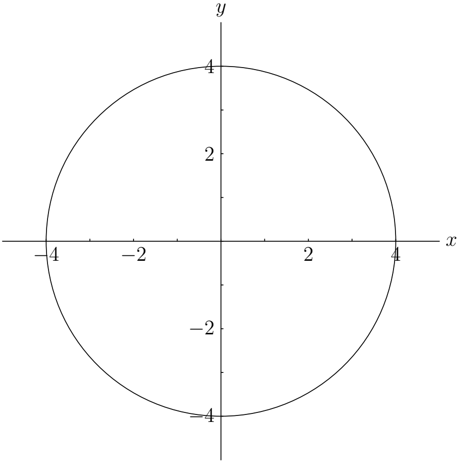
   $f(0) =$
   $f(12) =$

1.2.005a Determine whether the graph represents y as a function of x. Explain your answer.



- Yes, the vertical line test shows that the graph represents y as a function of x.
- Yes, the horizontal line test shows that the graph represents y as a function of x.
- No, the vertical line test shows that the graph does not represent y as a function of x.
- No, the horizontal line test shows that the graph does not represent y as a function of x.
- There is no way to determine this using the graph.

1.2.005b Determine whether the graph represents y as a function of x. Explain your answer.



- Yes, the vertical line test shows that the graph represents y as a function of x.
- Yes, the horizontal line test shows that the graph represents y as a function of x.
- No, the vertical line test shows that the graph does not represent y as a function of x.
- No, the horizontal line test shows that the graph does not represent y as a function of x.
- There is no way to determine this using the graph.

1.2.009 If $R(x) = 8x - 11$, find the following. (Give exact answers. Do not round.)

1. $R(0) =$

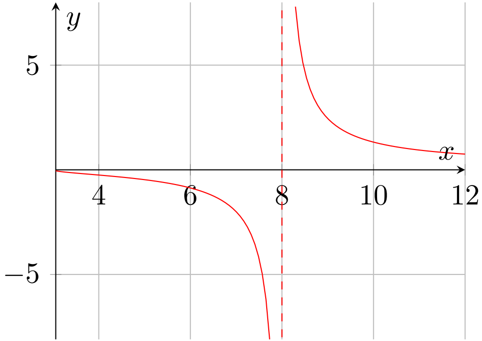
2. $R(2) =$

3. $R(-3) =$

4. $R(1.6) =$

1.2.029 A function and its graph are given. Find the domain. (Enter your answer using interval notation.)

$$f(x) = \frac{\sqrt{x-3}}{x-8}$$



Chapter R Section R1.3

1.3.001 Find the intercepts and graph.

$$5x + 8y = 40$$

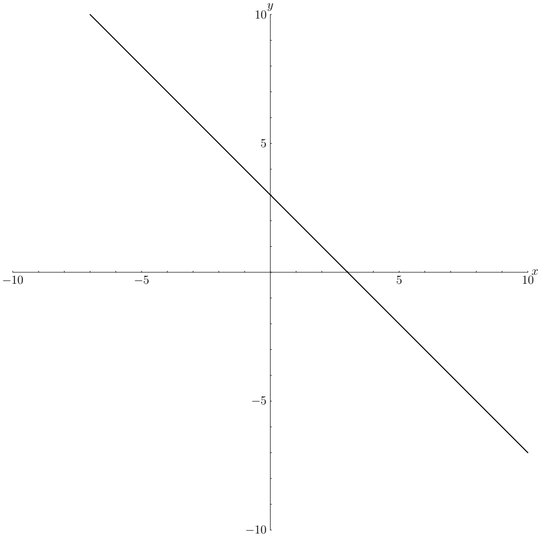
1.3.005 Find the slope m of the line passing through the given pair of points. (If an answer is undefined, enter UNDEFINED.)

$$(20, 21) \text{ and } (14, -3)$$

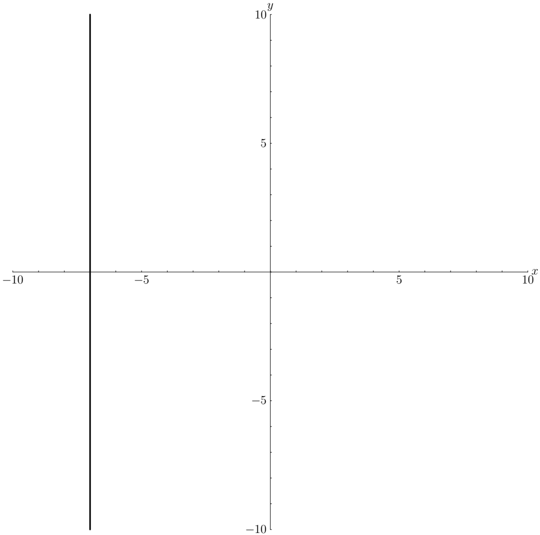
1.3.011 If a line is horizontal, then its slope is ______.

1.3.013 What is the rate of change of the function whose graph is a line passing through $(3, 4)$ and $(-1, 4)$?

1.3.015a For the given graph, determine whether the line has a slope that is positive, negative, 0, or undefined.



1.3.015b For the given graph, determine whether the line has a slope that is positive, negative, 0, or undefined.



1.3.017 Find the slope m and y-intercept b. (Give exact answers. Do not round. If an answer is undefined, enter UNDEFINED. If an answer does not exist, enter DNE.)

$$y = \frac{7}{3}x - \frac{1}{2}.$$

1.3.023 Find the slope m and y-intercept b. (Give exact answers. Do not round. If an answer is undefined, enter UNDEFINED. If an answer does not exist, enter DNE.)

$$2x + 7y = 14.$$

1.3.025 Write the slope-intercept form of the equation of the line that has the given slope and y-intercept.

$$\text{Slope } \tfrac{1}{3} \text{ and } y\text{-intercept } -3$$

1.3.033 Write the equation of the line that passes through the given point and has the given slope.

$$(-2, 2) \text{ with undefined slope}$$

1.3.035 Write the equation of the line described.

Through $(4, 5)$ and $(-1, -5)$

1.3.041 Determine whether the following pair of equations represents parallel lines, perpendicular lines, or neither of these.

$$3x + 8y = 24; \quad 8x - 3y = 24$$

1.3.045 Write the equation of the line passing through $(-2, -1)$ that is parallel to $3x + 5y = 11$.

Chapter R Section R1.6

In engineering and science, dimensional analysis is the analysis of the relationships between different physical quantities by identifying their base quantities (such as length, mass, time, and electric current) and units of measurement (such as metres and grams) and tracking these dimensions as calculations or comparisons are performed.

The term dimensional analysis is also used to refer to conversion of units from one dimensional unit to another, which can be used to evaluate scientific formulae.[1]

[1] https://en.wikipedia.org/wiki/Dimensional_analysis

1.6.005a A linear cost function is $C(x) = 3x + 750$. (Assume C is measured in dollars.)

1. What are the slope and the C-intercept?
2. What is the marginal cost C' ($\overline{MC}$)?
3. What does the marginal cost mean?

   a) Each additional unit produced costs this much (in dollars).

   b) If production is increased by this many units, the cost decreases by \$1.

   c) If production is increased by this many units, the cost increases by \$1.

   d) Each additional unit produced reduces the cost by this much (in dollars).

4. What are the fixed costs?
5. How are your answers to parts (1), (2), and (3) related?

   a) $\dfrac{C\text{-intercept}}{slope}$ = marginal cost

   b) slope = fixed costs, and C-intercept = marginal cost

   c) slope = marginal cost, and C-intercept = fixed costs

   d) $\dfrac{slope}{C\text{-intercept}}$ = marginal cost

6. What is the cost of producing one more item if 50 are currently being produced? What is the cost of producing one more item if 100 are currently being produced?

1.6.007 A linear revenue function is $R = 26x$. (Assume R is measured in dollars.)

1. What is the slope m?
2. What is the marginal revenue R'?
   What does the marginal revenue mean?

   a) Each additional unit sold decreases the revenue by this many dollars.

   b) If the number of units sold is increased by this amount, the revenue increases by \$1.

   c) Each additional unit sold yields this many dollars in revenue.

   d) If the number of units sold is increased by this amount, the revenue decreases by \$1.

3. What is the revenue received from selling one more item if 50 are currently being sold?
   What is the revenue received from selling one more item if 100 are being sold?

1.6.001 Suppose a calculator manufacturer has the total cost function $C(x) = 22x + 6600$ and the total revenue function $R(x) = 56x$.

1. What is the equation of the profit function $P(x)$ for the calculator?

2. What is the profit on 2800 units?

1.6.003 Suppose a ceiling fan manufacturer has the total cost function $C(x) = 34x + 560$ and the total revenue function $R(x) = 48x$.

1. What is the equation of the profit function P(x) for this commodity?
   $P(x) =$
2. What is the profit on 20 units?

   Interpret your result.
   - The total costs are less than the revenue.
   - The total costs are more than the revenue.
   - The total costs are exactly the same as the revenue.
3. How many fans must be sold to avoid losing money?

1.6.009 Let $C(x) = 3x + 750$ and $R(x) = 21x$.

1. Write the profit function $P(x)$.
2. What is the slope m of the profit function?
3. What is the marginal profit P'?
4. Interpret the marginal profit.

   a) Each additional unit sold decreases the profit by this much.

   b) Each additional unit sold increases the profit by this much.

   c) This is the smallest number of units that can be sold in order to make a profit.

   d) The profit is maximized when this many units are sold.

1.6.013 1-3 Extreme Protection, Inc. manufactures helmets for skiing and snowboarding. The fixed costs for one model of helmet are \$4700 per month. Materials and labor for each helmet of this model are \$50, and the company sells this helmet to dealers for \$70 each. (Let x represent the number of helmets sold. Let C, R, and P be measured in dollars.)

1. For this helmet, write the function for monthly total costs $C(x)$.
   $C(x) =$

2. Write the function for total revenue $R(x)$.
   $R(x) =$

3. Write the function for profit $P(x)$.
   $P(x) =$

1.6.013 4 Extreme Protection, Inc. manufactures helmets for skiing and snowboarding. The fixed costs for one model of helmet are \$4700 per month. Materials and labor for each helmet of this model are \$50, and the company sells this helmet to dealers for \$70 each. (Let x represent the number of helmets sold. Let C, R, and P be measured in dollars.)

4. Find $C(200)$.
   $C(200) =$

   Interpret $C(200)$.
   - For each \$1 increase in cost this many more helmets can be produced.
   - This is the cost (in dollars) of producing 200 helmets.
   - For every additional helmet produced the cost increases by this much.
   - When this many helmets are produced the cost is \$200.

1.6.013 4 Extreme Protection, Inc. manufactures helmets for skiing and snowboarding. The fixed costs for one model of helmet are \$4700 per month. Materials and labor for each helmet of this model are \$50, and the company sells this helmet to dealers for \$70 each. (Let x represent the number of helmets sold. Let C, R, and P be measured in dollars.)

4. Find $R(200)$.
   $R(200) =$

   Interpret $R(200)$.
   - When this many helmets are produced the revenue generated is \$200.
   - For each \$1 increase in revenue this many more helmets can be produced.
   - For every additional helmet produced the revenue generated increases by this much.
   - This is the revenue (in dollars) generated from the sale of 200 helmets.

1.6.013 4 Extreme Protection, Inc. manufactures helmets for skiing and snowboarding. The fixed costs for one model of helmet are \$4700 per month. Materials and labor for each helmet of this model are \$50, and the company sells this helmet to dealers for \$70 each. (Let x represent the number of helmets sold. Let C, R, and P be measured in dollars.)

4. Find $P(200)$.
   $P(200) =$

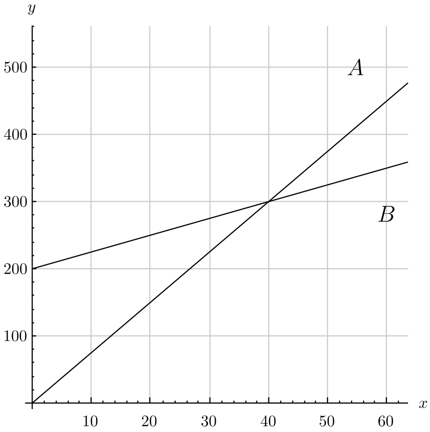
   Interpret $P(200)$.
   - This is the profit (in dollars) when 200 helmets are sold, but since it is negative it means that the company loses money when 200 helmets are sold.
   - For each additional helmet sold the profit (in dollars) increases by this much, but since it is positive it means that the company is producing too many helmets.
   - For each additional helmet sold the profit (in dollars) increases by this much, but since it is negative it means that the company needs to decrease the number of helmets sold in order to make a profit.
   - This is the profit (in dollars) when 200 helmets are sold, and since it is positive it means that the company makes money when 200 helmets are sold.

1.6.013 5,6 Extreme Protection, Inc. manufactures helmets for skiing and snowboarding. The fixed costs for one model of helmet are \$4700 per month. Materials and labor for each helmet of this model are \$50, and the company sells this helmet to dealers for \$70 each. (Let x represent the number of helmets sold. Let C, R, and P be measured in dollars.)

5. Same as the last part but with \$300 instead of \$200.
6. Find the marginal profit P'.
   $P' =$

   Write a sentence that explains its meaning.
   - When revenue is increased by this much the profit is increased by \$1.
   - For each \$1 increase in profit this many more helmets can be produced.
   - When costs are decreased by this much the profit is increased by \$1.
   - Each additional helmet sold increases the profit by this many dollars.

1.6.015 The figure shows graphs of the total cost function and the total revenue function for a commodity. (Assume cost and revenue are measured in dollars.)



1. Label each function correctly. Choose from *total revenue function*, *total cost function*

   a) function A

   b) function B

2. Determine the fixed costs.

3. Locate the break-even point. $(x, y) =$
   Determine the number of units sold to break even.

4. Estimate the marginal cost C' and marginal revenue R'.

Definition 1 (Market equilibrium)

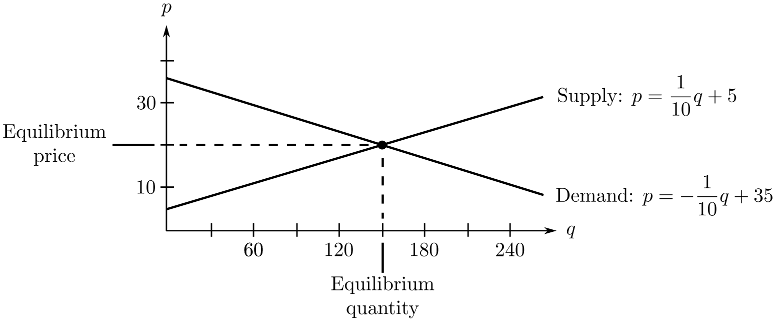
occurs when the quantity of a commodity demanded is equal to the quantity supplied.

Law 1 (Law of demand)

states that the quantity demanded will increase as price decreases and that the quantity demanded will decrease as price increases.

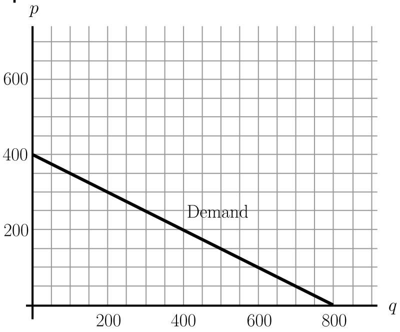
Law 2 (Law of supply)

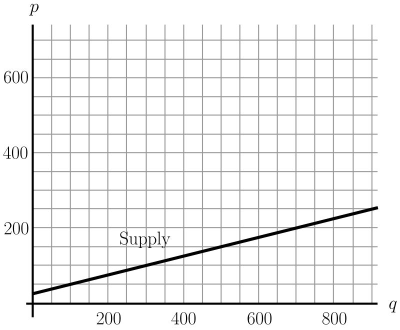
states that the quantity supplied for sale will increase as the price of a product increases.



p
30
10
Equilibrium price
Supply: $p = \frac{1}{10}q + 5$
Demand: $p = -\frac{1}{10}q + 35$
60
120
180
240
q
Equilibrium quantity

1.6.031 The graphs of the demand function and supply function for a certain product, are given below. Use these graphs to answer the questions.





1. How many units q are demanded when the price p is \$50?
2. How many units q are supplied when the price p is \$50?
3. Will there be a market surplus (more supplied) or shortage (more demanded) when p = \$50?

1.6.033 If the demand for a pair of shoes is given by $2p + 5q = 200$ and the supply function for it is $p - 2q = 10$, compare the quantity demanded and the quantity supplied when the price is \$90.

quantity demanded _____ pairs of shoes

quantity supplied _____ pairs of shoes

Will there be a surplus or shortfall at this price?

Chapter 1 Section 5

Ex 1 Graphical method

$$\left\{\begin{array}{rcrcr} x & + & y & = & 2 \\ x & + & y & = & -1 \end{array}\right.$$

Ex 2 Graphical method

$$\left\{\begin{array}{rcrcr} x & + & y & = & 2 \\ x & - & 2y & = & -1 \end{array}\right.$$

Ex 3 Graphical method

$$\begin{cases} x + y = 1 \\ 2x + 2y = 2 \end{cases}$$

Ex 4 Graphical method

$$\begin{cases} y &= x^2+1 \\ y &= x+1 \end{cases}$$

Ex 5 Graphical method

$$\begin{cases} y &= x^2 - 1 \\ y &= 0 \end{cases}$$

Ex 6 Substitution method

$$\begin{cases} x + y = 2 \\ x - 2y = -1 \end{cases}$$

Ex 7 Substitution method

$$\begin{cases} x + y = 2 \\ x + y = -1 \end{cases}$$

Ex 8 Substitution method

$$\begin{cases} x + y = 1 \\ 2x + 2y = 2 \end{cases}$$

Ex 9 Substitution method

$$\left\{\begin{array}{rcrcrcr} x & - & 3y & + & z & = & 0 \\ & & y & - & z & = & 3 \\ & & & & z & = & -2 \end{array}\right.$$

Ex 10 Elimination method

$$\begin{cases} x + y = 1 \\ x - y = 2 \end{cases}$$

Ex 11 Elimination method

$$\begin{cases} x + y = 2 \\ x - 2y = -1 \end{cases}$$

Ex 12 Elimination method

$$\begin{cases} 2x & + & 3y & = & 9 \\ x & - & y & = & 2 \end{cases}$$

Ex 13 Elimination method

$$\left\{\begin{array}{rcrcr} 8x & - & 3y & = & -11 \\ 5x & - & 2y & = & -6 \end{array}\right.$$

Ex 14 Elimination method

$$\begin{cases} x + y = 2 \\ x + y = -1 \end{cases}$$

Ex 15 Elimination method

$$\begin{cases} \begin{array}{rcrcr} x & + & y & = & 1 \\ 2x & + & 2y & = & 2 \end{array} \end{cases}$$

Ex 16 Elimination method

$$\left\{\begin{array}{rcrcrcr} x & - & 3y & + & z & = & 0 \\ & & y & - & z & = & 3 \\ & & & & z & = & -2 \end{array}\right.$$

Ex 17 Elimination method

$$\left\{\begin{array}{rcrcrcr} x & + & y & + & z & = & 4 \\ x & + & 3y & + & 3z & = & 10 \\ 2x & + & y & - & z & = & 3 \end{array}\right.$$

Ex 1.5.039 A freight company has shipping orders for two products. The first product has a unit volume of 10 cu ft and weighs 50 lb. The second product's unit volume is 3 cu ft, and it weighs 40 lb. If the company's trucks have $2,290$ cu ft of space and can carry $20,700$ lb, how many units of each product can be transported in a single shipment with one truck using the entire volume and weight capacity?

Ex 1.5.044 A biologist has a 40% solution and a 10% solution of the same plant nutrient. How many cubic centimeters of each solution should be mixed to obtain 25 cc of a 22% solution?

Chapter 1 Section R1.6 Part Deux

1.6.044 Find the market equilibrium point for the following demand and supply functions.

Demand: $p = -2q + 318$

Supply: $p = 8q + 1$

$(q, p) =$

1.6.049.EP A group of retailers will buy 104 televisions from a wholesaler if the price is \$325 and 144 if the price is \$275. The wholesaler is willing to supply 84 if the price is \$255 and 164 if the price is \$345. Assume that the resulting supply and demand functions are linear. Let p represent price (in dollars) and q represent quantity.

State the two ordered pairs for the demand function in the form (q, p).

$(q, p) =$

$(q, p) =$

Write the demand function in terms of q.

$p =$

State the two ordered pairs for the supply function in the form (q, p).

$(q, p) =$

$(q, p) =$

Write the supply function in terms of q.

$p =$

Find the equilibrium point for the market in the form (q, p).

$(q, p) =$