1 Review

Homework Review

1. homework if absent

2. return to graphing and consider exact vrs approx for x-intercepts

3. are intercepts ordered pairs or numbers: officially points in CME - but they ask on page 347 whether they are negative. so ambiguous.

4. How specifically does changing y-intercept affect graph?

5. $2[x - 4 = 7] = 2x - 8 = 14$ is inadmissible.

6. bounciness -someone presents bouncing ball

7. exact for last ups problem; reprise exact

8. solution of a system is an ordered pair

Linearity vrs Proportionality
What is the difference?

Linear: $y = ax + b$
proportional: $y = ax$

Bounciness
COEFFICIENT OF RESILIENCY
This is a physical constant, a property of the kind of ball, tells you what per cent the bounce height will be of the drop height.
A good experiment is to use several balls.
Other examples???

Domain ?
CME page 434 number 11.
What is the domain of $x \mapsto \frac{1}{x-|x|}$?

1. What does this question mean in words?

2. What is the answer?

1. What is the largest set of real numbers for which this rule makes sense?

2. the negative real numbers.

2 Systems of Inequalities

2.1 Inequalities in one variable

One Variable Inequalities

CME page 384: Talk about this worked out problem. What is the logical relation between successive lines on the top of page 385?

Here is a different way to write the solution. What is the logical relation between successive lines of:

$$
\begin{array}{rcll}
43 + 2m & < & 25 + 4m & \text{Subtract 25 from both sides} \\
18 + 2m & < & 4m & \text{Subtract } 2m \text{ from both sides} \\
18 & < & 2m & \text{Divide 2 into each side} \\
9 & < & m &
\end{array}
$$

What is a solution of an inequality?

What is a solution of an inequality *in one variable*?

The solution of a (system of) inequal (ities) in one variable is an 'interval'. I.e.

one of:

1. $x < a$, $x \le a$:

2. $a < x$, $a \le x$:

3. $a < x < b$, $a < x \le b$, $a \le x \le b$, $a \le x < b$

We manipulate the inequal(ities) to get such a solution.

One Variable Inequalities II

Solve the inequality

$$-2x + 3 < 7.$$

Basic Moves

One new twist on the basic moves:

If an inequality is multiplied or divided by a negative number the inequality reverses.

$$-2x < 10$$

implies

$$x > 5$$

WHY?

Phone Plans

Plan 1: $30 plus $.03 cents per minute

Plan 2: $20 plus $.05 cents per minute

Plan 3: $60 unlimited minutes

For how many minutes of use per month should you choose each plan?

Linear Programming: Systems of Inequalities

A phone company makes two kinds of phones. Each deluxe phone requires 3 hours of Machine A time and 1 hour of machine B. Each standard phone requires 2 hours of Machine A time and 2 hour of machine B. If Machine A is run for at most 12 hours and Machine B for at most 8 hours what are the possible combinations of numbers of standard and deluxe phones that can be made?

$$
\begin{align}
3x + 2y &\leq 12 \tag{1} \\
x + 2y &= 2x - 11 \tag{2} \\
x &\geq 0 \tag{3} \\
y &\geq 0 \tag{4}
\end{align}
$$

Linear Programming: Maximization

Suppose the company makes $9 on each deluxe phone and $6 on each standard phone. How should they maximize their profit.

$P(x, y) = 9x + 6y$

Check at the four vertices.

(linprog.doc)

Functions of Two Variables

Note that $P(x, y)$ has two arguments.

Compare $^-$ and $-$.

Systems of Inequalities

Shade the set of points in the plane that satisfy the following inequalities.

$$
\begin{cases}
x &> -2y + 3 \\
x + y &> 4 \\
y &\leq 2
\end{cases}
$$

Conventions

Use dotted line if points are not in the set.

Use solid lines if points are included.

If vertex is include make solid dot. If not make hollow dot.

Write your convention on the paper; there is no standard convention.

What is a solution of an inequality?

What is a solution of a system inequalities *in two variables*?

A set of points in the plane (bounded by lines).

The phone problem situation

Three phone companies charge the same amount per phone and per minute but offer different programs.

1. Horizon: 2 phones, 1000 minutes cost $80

2. T-stopped: 3 phones, 1200 minutes cost $150

3. WAIT: 4 phones, 2000 minutes cost $250

Questions

1. How can we describe the situation mathematically?

2. Is it true that they are charging the same amount per phone and per month?

Who should buy which plan?

Expressing the phone situation

Let P be the number of phones owned.
Let M be the number of minutes used.

$$
\begin{align}
C_H(P, M) &= 2P + 1000M \tag{5}\\
C_T(P, M) &= 3P + 1200M \tag{6}\\
C_M(P, M) &= 4P + 2000M \tag{7}
\end{align}
$$

where C_H etc. is the cost in dollars per month of the Horizon plan.