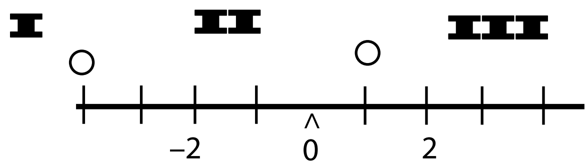
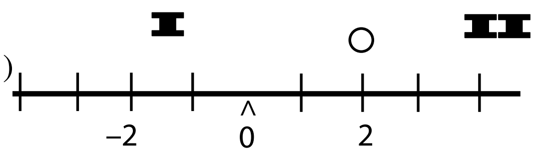
Mr. Mumaugh
Math 104
Interval #3

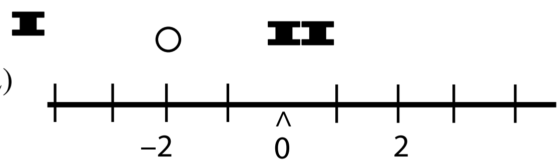
Write a statement describing each of the intervals indicated on the numberline by the roman numerals.
We will be including "equals" for the ***left-hand*** end of the interval.

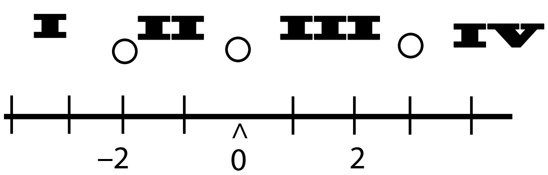
Example: 

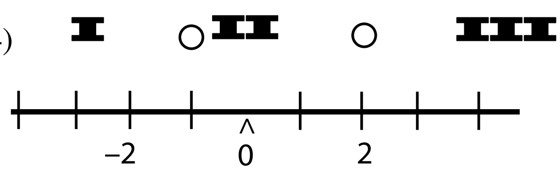
I	II	III
$x < -4$	$-4 \le x < 1$	$x \ge 1$

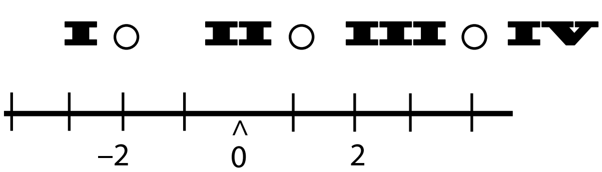
In the above example, notice that the – 4 in interval I is *not* included because the – 4 is on the *right* end of the interval. In interval II however, the – 4 is included because – 4 is the left end of the second interval. Also in the second interval, the 1 is not included because, again, it is the right end of the interval. Likewise, the 1 is included in interval III because 1 is the left end of the interval.

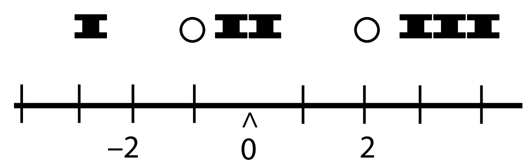
1) 

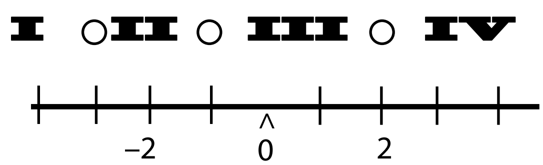
2) 

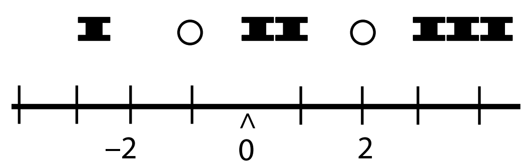
3) 

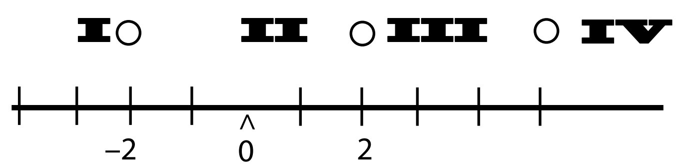
4) 

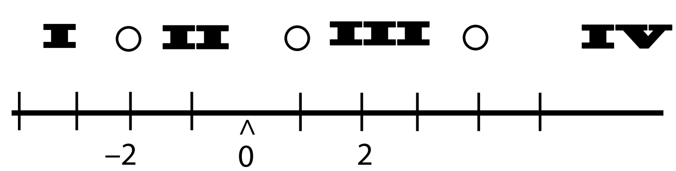
5) 

6) 

7) 

8) 

9) 

10) 

a) $x < -2$; $-2 \le x < 1$; $1 \le x < 4$; $x \ge 4$

b) $x < -1$; $-1 \le x < 2$; $x \ge 2$

c) $x < -2$; $x \ge -2$

d) $x < -2$; $-2 \le x < 1$; $1 \le x < 4$; $x \ge 4$

e) $x < -1$; $-1 \le x < 2$; $x > 2$

f) $x < -2$; $-2 \le x < 0$; $0 \le x < 3$; $x \ge 3$

g) $x \le 2$; $x \ge 2$

h) $x < -2$; $-2 \le x < 2$; $2 \le x < 5$; $x \ge 5$

i) $x < -1$; $-1 \le x < 2$; $x \ge 2$

j) $x < -3$; $-3 \le x < -1$; $-1 \le x < 2$; $x \ge 2$

Mr. Mumaugh
Math 104
Interval #4

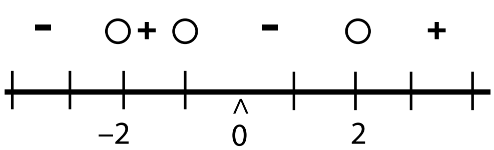
We know that the product of 2 negative numbers is positive. The rule is that when we have an even number of negative signs, the product is positive. We use this fact to quickly determine the status of an expression. In example #1 below, if we select a very positive number (my personal favorite selection) each of the 3 factors are all positive. Let's say my number was 10; then 10 + 2 is positive; 10 + 1 is positive; and 10 – 2 is positive. We have zero negative numbers (zero is an even number) so when x = 10 the expression is positive. In fact whenever x is *any* number greater than + 2, the expression is positive.

What happens when x is less than 2 but greater than – 1? For example, I will select zero. 0 +2 is positive, 0 + 1 is positive; and 0 – 2 is negative. Odd number of negative factors, therefore x = 0 and all other numbers in that interval will yield a negative product. We could continue this process for the remaining two intervals but it is really unnecessary. We can see a pattern. The signs alternate from plus to minus.

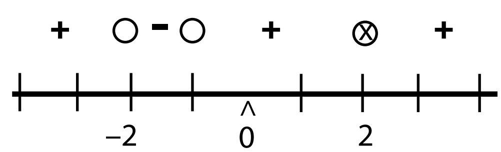
This alternating will occur unless there is a reason for it *not* to occur. In example #2 below, notice that the factor (x – 2) is squared. It is never negative so x = 2 is called a *nonparticipating* point. The circle over the 2 has an X in it signifying that the sign will not change as we move across that point. As I did with example #1, I will select zero to *test* to see if we have positive or negative: 0 +2 is positive,
0 + 1 is positive; and 0 – 2 squared is positive so zero and all numbers in that interval yield a positive product!

Determine ***only*** if a number in each interval makes the expression positive or negative.

Example#1: $(x+2)(x+1)(x-2)$



Example #2 $(x+2)(x+1)(x-2)^2$



1) $(x+3)(x-2)$

2) $(3-x)(x+4)$

3) $(x+1)(2-x)$

4) $(x+3)(x+1)^2(x-2)$

5) $(x+2)(x+1)(x-2)^2$

6) $(x+1)^2(x-2)^2$

7) $(x+3)^2(x+1)(x-2)$

8) $(x+3)(x+1)^2(x-2)^2$

9) $(x+1)x(x-3)$

10) $(x+1)x^2(x-3)$

11) $\dfrac{(x+1)(x-3)}{(x-1)}$

12) $\dfrac{(x+1)(x-3)}{(x-1)^2}$

Section 4.4 discusses graphing a line that contains an inequality.

$8x + 3y > 24$

Solve for *y*: $y > -\frac{8}{3}x + 8$ and graph as though it was $y = -\frac{8}{3}x + 8$.

We locate the *y*-intercept as usual. We count down 8 and then 3 to the right. Because our equation is a "strict inequality" we dot our line instead of drawing a solid line. Finally we want ***y* greater than**. "Greater than" is **above** therefore, shade the above side of the line.

If the line we needed to draw was $x \leq 3$, we would draw a vertical line at $x = 3$ then shade to the **left** because we needed *x* **less than** or equal to 3.

The examples in the text are excellent. Be sure that you understand each of them.

Section 4.5 discusses "Linear Programming".

You will find Linear Programming to be interesting and fun.

The key to this is that all the equations are drawn on the same axis. The area common to *all* the graphs is shaded. The corners of this figure contain values that will give extreme results in the system of equations. You must find the corners and then substitute the coordinates into a "Goal Statement". If the Goal Statement described maximum profit, you would select the coordinate pair that made the Goal Statement as large as possible.

Remember to write a sentence answer for your problems.

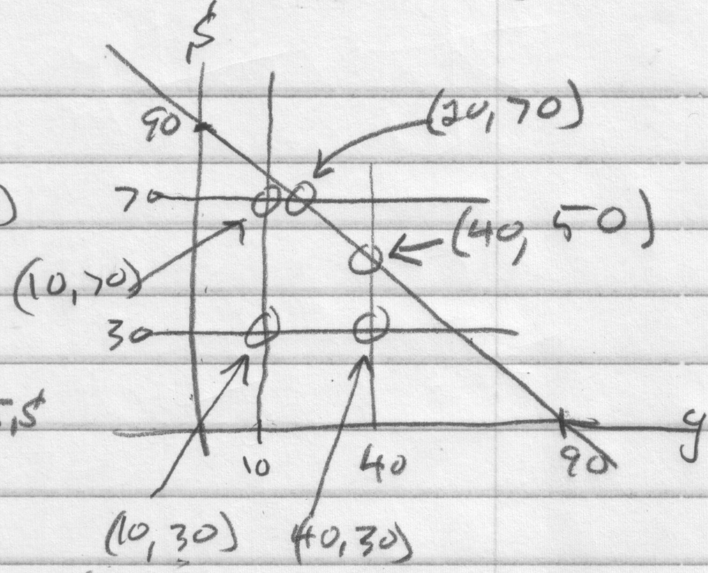
(13) let g = gumbo
$ = sandwiches

$10 \le g \le 40$ (G,S)

$30 \le \$ \le 70$

$g + \$ \le 90$

objective $165P + 105\$$



$165(40) + 105(50) = 7100$

$165(20) + 105(70) = 4000$ > (10,70)

$165(40) + 105(30) = 6900$ > (10,30)

~~165(10)~~

MAX income selling 40 gumbo and 50 sandwiches

(15) let F = 4 per page
(F,$) $ = 6 per page

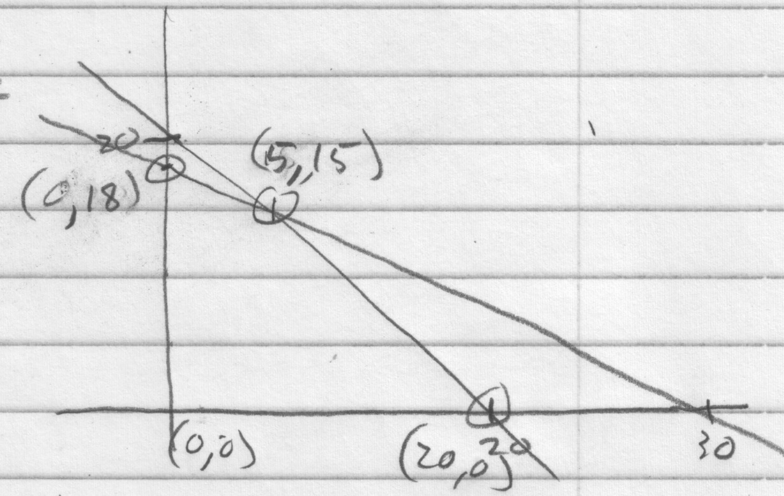
$3F + 5\$ \le 90$

$F + \$ \le 20$

$5\$ \le -3F + 90$

$\$ \le -\frac{3}{5}F + 18$

$\$ \le -F + 20$



$-\frac{3}{5}F = 18 \frac{5}{3}$

$F = 30$

$3F + 5\$ = 90$

$-3F - 3\$ = -60$

$2\$ = 30$

$\$ = 15$

$4F + 6\$$

$4 \cdot 5 + 6 \cdot 15 = 110$ photos

$4 \cdot 20 + 6 \cdot 0 = 80$

$4 \cdot 0 + 6 \cdot 18 = 108$ photos

she can use 5 4 per page and 15 6 per page for a total of 110 photos.