

## MATH 121

### Absolute Value Problems

1. (Section 2.5) Write an inequality of the form  $|x - a| < C$  or of the form  $|x - a| > C$  so that the inequality has the given solution set.

- a)  $(-3, 3)$
- b)  $(-2, 8)$
- c)  $(3, 17)$
- d)  $(-\infty, 9) \cup (13, \infty)$

2. (Section 2.5) Solve each of the following algebraically and use your calculator to check your solution.

a)  $|x^2 - 5x| = 6$

b)  $|x^2 + 81| = 18x$  (Be careful here...)

c)  $|x - 4| = x - 4$  (Be extra careful here...)

3. (Section 2.5) Solve for  $x$  in each of the following equations.

(a)  $\frac{3}{8} - \left| \frac{3}{4}x + 2 \right| = 1$       (b)  $\frac{3}{8} - \left| \frac{3}{4}x + 2 \right| = -1$

(c)  $\frac{3}{8} - \left| \frac{3}{4}x + 2 \right| = -\frac{13}{8}$       (d)  $\left| \frac{3}{4}x + 2 \right| = \left| \frac{3}{4}x - 2 \right|$

4. (Section 2.6) Let  $f(x) = 1 - 2\left| \frac{x+1}{5} \right|$ . Find all numbers,  $x$ , such that  $f(x) \leq -1$ .

5. (Section 2.6) Solve for  $x$  in each of the following.

(a)  $8\left| \frac{-x}{2} + 7 \right| - 7 < -3$       (b)  $9 - 5\left| \frac{1-x}{3} \right| \leq -21$

(c)  $\frac{1 - |1 - 2x|}{5} > \frac{1}{2}$       (d)  $\frac{|1 - 2x| - 1}{5} > \frac{1}{2}$

6. (Section 2.6) Solve each of the following, using interval notation for your solution:

a)  $\left| \frac{x+1}{3} \right| - 4 \leq -2$

b)  $5 - 2|3x + 1| > 6$

**Answer Keys:**

1. Note that  $|x-a| < C$  means that  $x$  is less than  $C$  units from  $a$  and  $|x-a| > C$  means that  $x$  is more than  $C$  units from  $a$  on the real line. So if the interval is  $(4, 8)$  then since 6 is the midpoint of 4 and 8, the inequality is  $|x-6| < 2$ .

- a)  $|x| < 3$
  - b)  $|x-3| < 5$
  - c)  $|x-10| < 7$
  - d)  $|x-11| > 2$
2. a) 6, -1, 3, 2  
b) 9  
c)  $x \geq 4$
3. a) no solution  
b)  $\frac{-27}{6}$   
c)  $x = 0$   
d)  $x = 0$
4.  $(-\infty, -6] \cup [4, \infty)$
5. (a)  $15 > x > 13$   
(b)  $(-\infty, -17] \cup [19, \infty)$   
(c) no solution  
(d)  $\left(-\infty, -\frac{5}{4}\right] \cup \left[\frac{9}{4}, \infty\right)$
6. (a)  $-7 \leq x \leq 5$   
(b) no solution