MATH 121
Absolute Value Problems

1. (Section 3.5)   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 4.6)   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 3.5)   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 3.5)   Let $f(x) = 1 - 2\left|\dfrac{x+1}{5}\right|$.   Find all numbers, x, such that $f(x) \le -1$.

5. (Section 3.5)   Solve for x in each of the following.

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

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

6. (Section 3.5)   Solve each of the following, using interval notation for your solution:

   a) $\left|\dfrac{x+1}{3}\right| - 4 \le -2$ 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) $\dfrac{-27}{6}$
    c) $x=0$
    d) $x=0$

4. $\left(-\infty,-6\right]\cup\left[4,\infty\right)$

5.   (a) $15>x>13$
    (b) $\left(-\infty,-17\right]\cup\left[19,\infty\right)$
    (c) no solution
    (d) $\left(-\infty,-\dfrac{5}{4}\right]\cup\left[\dfrac{9}{4},\infty\right)$

6.   (a) $-7\leq x\leq 5$
    (b) no solution