

Assignment #1

Name Answer Key

Due 4 September 2009

1. Solve the following inequalities. In each case, express your answer in proper set notation.

(a) $|x+1| \geq 3$ Either $x+1 \geq 3$ or $x+1 \leq -3$

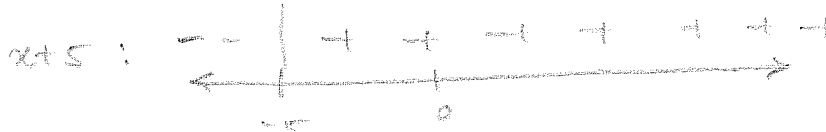
2 Thus $x \geq 2$ or $x \leq -4$.

answer: $(-\infty, -4] \cup [2, +\infty)$
 or $\{x : x \leq -4 \text{ or } x \geq 2\}$

(b) $x^2 + x - 20 < 0$

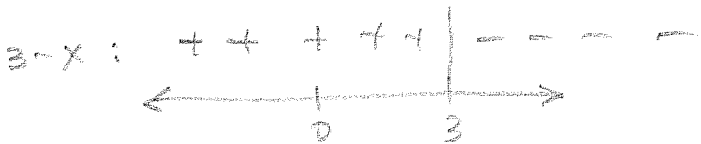
answer: $(-5, 4)$

2 $(x-4)(x+5) < 0$

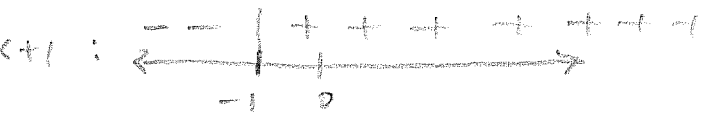


(c) $\frac{4}{x+1} \leq 1$

2 $\frac{4}{x+1} - 1 \leq 0$; $\frac{4 - (x+1)}{x+1} \leq 0$; $\frac{3-x}{x+1} \leq 0$



answer: $(-\infty, -1) \cup [3, +\infty)$



2. (a) Rewrite each of the sentences "The distance from x to 1 is strictly less than .01" and "The distance from y to 4 is strictly less than .005" using the absolute value symbol.

$$2 \quad |x - 1| < .01$$

$$|y - 4| < .005$$

- (b) Use the triangle inequality to give a bound for $|(x + y) - 5|$.

$$\begin{aligned} |(x+y) - 5| &= |(x-1) + (y-4)| \\ &\leq |x-1| + |y-4| < .01 + .005 \\ &= .015. \end{aligned}$$

3. A triangle in the plane has its vertices at $A(7/5, 19/5)$, $B(2, 3)$, and $C(21/13, 90/13)$.

- 2 (a) Which of its three sides \overline{AB} , \overline{AC} , or \overline{BC} is the longest?

$$d(A, B) = \sqrt{\left(2 - \frac{7}{5}\right)^2 + \left(3 - \frac{19}{5}\right)^2} = \sqrt{\left(\frac{3}{5}\right)^2 + \left(\frac{4}{5}\right)^2} = 1$$

$$d(A, C) = \sqrt{\left(\frac{21}{13} - \frac{7}{5}\right)^2 + \left(\frac{90}{13} - \frac{19}{5}\right)^2} = \sqrt{\left(\frac{14}{65}\right)^2 + \left(\frac{203}{65}\right)^2} = \frac{7}{\sqrt{5}} \approx 3.13$$

$$d(B, C) = \sqrt{\left(2 - \frac{21}{13}\right)^2 + \left(3 - \frac{90}{13}\right)^2} = \sqrt{\left(\frac{5}{13}\right)^2 + \left(\frac{51}{13}\right)^2} = \frac{\sqrt{2626}}{13} \approx 3.94$$

- (b) Is the triangle isosceles? Explain.

No. An isosceles triangle has two equal sides. In $\triangle ABC$, no two sides are equal.