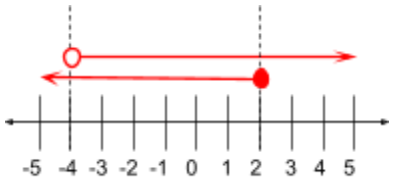
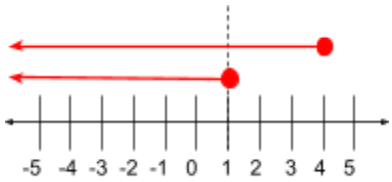
MHF4U: Polynomial Inequalities

1. For each diagram, indicate the interval that is common to sets of values.

a. 

b. 

2. Solve each inequality using cases. Confirm by sketching a graph.
   a. $(x - 3)(x + 2) > 0$
   b. $2(2x - 1)(x - 4) \leq 0$
   c. $-3(x + 1)(x + 3) \geq 0$
3. Solve each inequality in Q2 using intervals.
4. Solve each inequality using either cases or intervals. Confirm by sketching a graph.
   a. $2x^2 + 7x - 15 < 0$
   b. $x^3 + 6x^2 + 5x - 12 > 0$
   c. $-2x^3 + 2x^2 + 42x - 90 > 0$
   d. $4x^3 + 26x^2 + 46x + 24 \leq 0$
   e. $2x^4 - x^3 - 17x^2 + 16x + 12 > 0$
   f. $4x^4 - 12x^3 + x^2 + 12x + 4 < 0$
5. How many cases must be considered to solve $(x - 1)(x + 3)(2x - 1)(3x + 1) \geq 0$? Would using intervals be a more effective method? Explain.
6. A rectangular cardboard box, with original dimensions of $20 \times 12 \times 6$ cm, has its dimensions increased by the same amount. By what minimum amount should the dimensions be increased to produce a new box with a volume of at least $3\,840$ cm^3?
7. Solve $4x^3 - 12x + 3 > 3x^3 + 5x + 7$.

Solutions

1. a. $(-4, 2]$ b. $(-\infty, 1]$
2. a. $(-\infty, -2) \cup (3, \infty)$ b. $(-\infty, \frac{1}{2}] \cup [4, \infty)$ c. $[-3, -1]$
4. a. $\left(-5, \frac{3}{2}\right)$ b. $(-4, -3) \cup (1, \infty)$ c. $(-\infty, -5)$ d. $(-\infty, -4) \cup \left(-\frac{3}{2}, -1\right)$
   e. $(-\infty, -3) \cup \left(-\frac{1}{2}, 2\right) \cup (2, \infty)$ f. no solution
5. 8; explanations may vary
6. 4 cm
7. $(-4, 2 - \sqrt{5}) \cup (2 + \sqrt{5}, \infty)$