

Polynomial & Rational Inequalities (selected answers)

$x-2$
 $x+3$

 $(-\infty, -3) \cup (2, \infty)$

$2x-1$
 $x-1$

 $(-1, 1)$

$3x+1$
 $x-4$

 $[-1, 4]$

$x+2$
 $x+4$

 $(-\infty, -4] \cup [-2, \infty)$

x
 $x-2$

 $(-\infty, 0] \cup [2, \infty)$

x
 $x+3$

 $[-3, 0]$

x^2
 $x+5$

 $(-\infty, -5)$

$x-6$
 $x+3$

 $[6, \infty)$

$x+3$
 $x-2$

 $(-\infty, 2) \cup (3, \infty)$

$2x^2+5x-12 > 0$
 $(2x-3)$
 $(x+4)$

 $(-\infty, -4) \cup (3/2, \infty)$

$4x^3-12x^2 > 0$
 $4x^2(x-3)$
 $4x^2$
 $x-3$

 $(3, \infty)$

$x^2 \leq 4$
 $x^2-4 \leq 0$
 $x-2$
 $x+2$

 $[-2, 2]$

x^2

 $(-\infty, -1) \cup (0, \infty)$

$[-2, 2] \cup [3, \infty)$

$(0, 1) \cup (3, \infty)$

$[-7, -5] \cup [1, 6]$

$(x-3)(x-2) \geq 0$
 $(x-1)(x+1)$

 $(-\infty, -1) \cup [1, 2] \cup [3, \infty)$

$\frac{1}{x+1} - \frac{2}{1} < 0 \Rightarrow \frac{1-2(x+1)}{x+1} < 0 \Rightarrow \frac{-1-2x}{x+1} < 0$

 $x+1$

$-1-2x$

 $(-1, -1/2)$

$$46. \frac{2x+1}{x-1} - 3 \leq 0$$

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

$$\frac{2x+1-3x+3}{x-1} \leq 0$$

$$\frac{-x+4}{x-1} \leq 0$$



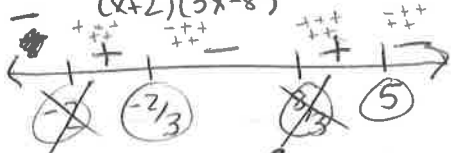
$$(-\infty, 1) \cup [4, \infty)$$

$$58. \frac{(x+2)5}{(x+2)(3x-8)} - \frac{x(3x-8)}{(x+2)(3x-8)} \geq 0$$

$$\frac{5x+10-3x^2+8x}{(x+2)(3x-8)} \geq 0$$

$$\frac{-3x^2+13x+10}{(x+2)(3x-8)} \geq 0$$

$$\frac{-(x-5)(3x+2)}{(x+2)(3x-8)} \geq 0$$



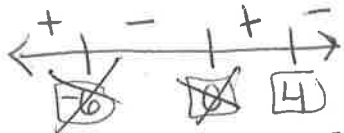
$$[-2, -2/3] \cup [5/3, 5]$$

$$47. \frac{2}{x} \geq \frac{5}{x+6}$$

$$\frac{-5(x)}{(x)(x+6)} + \frac{2(x+6)}{x(x+6)} \geq 0$$

$$\frac{-5x+2x+12}{x(x+6)} \geq 0$$

$$\frac{-3x+12}{x(x+6)} \geq 0 \quad \frac{-3(x+4)}{x(x+6)} \geq 0$$



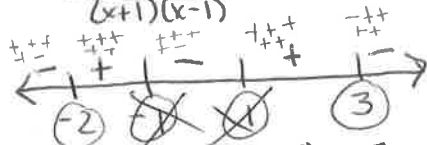
$$(-\infty, -6) \cup [4, \infty)$$

$$59. \frac{(x+1)3}{(x+1)(x-1)} - \frac{2(x-1)}{(x+1)(x-1)} - 1 \leq 0$$

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

$$\frac{-x^2+x+6}{(x+1)(x-1)} \leq 0$$

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

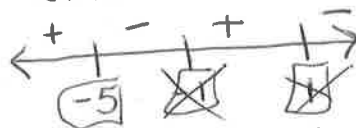


$$(-\infty, -2] \cup [-1, 1] \cup [3, \infty)$$

$$48. \frac{2(x-1)}{(x+1)(x-1)} - \frac{3(x+1)}{(x-1)(x+1)} \geq 0$$

$$\frac{2x-2-3x-3}{(x+1)(x-1)} \geq 0$$

$$\frac{-x-5}{(x+1)(x-1)} \geq 0$$



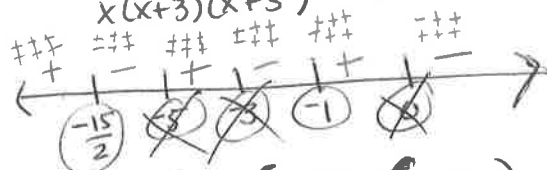
$$(-\infty, -5] \cup [-1, 1]$$

$$60. \frac{2(x+3)}{x(x+3)(x+5)} - \frac{3(x+5)}{x(x+3)(x+5)} - \frac{1}{x(x+3)(x+5)} \leq 0$$

$$\frac{2x^2+6x-3x^2-15x-x^2-8x-15}{x(x+3)(x+5)} \leq 0$$

$$\frac{-2x^2-17x-15}{x(x+3)(x+5)} \leq 0$$

$$\frac{-(x+1)(2x+15)}{x(x+3)(x+5)} \leq 0$$



$$[-15/2, -5] \cup [-3, -1] \cup [0, \infty)$$

Polynomial & Rational Inequalities

(Selected answers for numbers: 1, 2, 3, 4, 5, 6, 7, 10, 16, 19, 21, 28, 31, 35, 37, 39, 41, 43, 46, 47, 48, 58, 59, 60)

Solve and graph the following.

1. $(x-2)(x+3) > 0$
2. $(x-1)(x+1) < 0$
3. $(x+1)(x-4) \leq 0$
4. $(x+2)(x+4) \geq 0$
5. $x(x-2) \geq 0$
6. $x(x+3) \leq 0$
7. $x^2(x+5) < 0$
8. $x^2(x-2) > 0$
9. $(x+4)^2(x-6) \geq 0$
10. $(x-6)(x+3)^2 \geq 0$
11. $(x-2)(x-3)(x-4) > 0$
12. $(x-1)(x+1)(x+2) \leq 0$
13. $(x-1)^2(x+2)(x-2) < 0$
14. $(x-4)^2(x-2)^3 \geq 0$
15. $x^2 - 2x - 3 \geq 0$
16. $x^2 - 5x + 6 > 0$
17. $x^2 - 3x \leq 4$
18. $x^2 - 6x + 9 < 16$
19. $2x^2 + 5x > 12$
20. $2x^2 + 5x \leq 3$
21. $4x^3 - 12x^2 > 0$
22. $8x^2 + 10x > 3$
23. $4x^2 + 7 \leq 3x$
24. $x^3 - 4x^2 - x < 0$
25. $2x^3 - x^4 \leq 0$
26. $x^4 - 8x < 0$
27. $x^2 \geq 1$
28. $x^2 \leq 4$
29. $x^4 \geq x^2$
30. $x^3 \leq x^2$

31. $\frac{x}{x+1} > 0$
32. $\frac{x}{x-1} < 0$
33. $\frac{x+1}{x-3} \leq 0$
34. $\frac{x-2}{x+3} \geq 0$
35. $\frac{x-2}{(x+2)(x-3)} \geq 0$
36. $\frac{(x+1)(x-1)}{x-4} \leq 0$
37. $\frac{x(x-1)}{x-3} > 0$
38. $\frac{x-7}{x(x+2)} > 0$
39. $\frac{(x-6)(x+5)}{(x+7)(x-1)} \leq 0$
40. $\frac{(x-3)(x-2)}{(x+3)(x+2)} \leq 0$
41. $\frac{x^2 - 5x + 6}{x^2 - 1} \geq 0$
42. $\frac{x^2 - x - 20}{x^2 - 3x - 4} \geq 0$
43. $\frac{1}{x+1} < 2$
44. $\frac{x}{x-1} > 1$
45. $\frac{3x-5}{x-5} > 4$
46. $\frac{2x+1}{x-1} \leq 3$
47. $\frac{2}{x} \geq \frac{5}{x+6}$
48. $\frac{2}{x+1} \geq \frac{3}{x-1}$
49. $\frac{1}{x-3} \leq \frac{9}{4x+3}$
50. $\frac{1}{x+2} \geq \frac{1}{x-2}$
51. $\frac{3}{x+2} > \frac{2}{x+1}$
52. $\frac{1}{x} < \frac{1}{x+3}$
53. $\frac{3x}{x-1} \geq \frac{x}{x+4}$
54. $\frac{2x}{x+4} \leq \frac{5}{x}$
55. $\frac{x}{x-1} \leq \frac{8}{x+2}$
56. $\frac{x}{x+12} < \frac{1}{x+5}$
57. $\frac{2x}{x+4} > \frac{3}{x-1}$
58. $\frac{5}{3x-8} \geq \frac{x}{x+2}$
59. $\frac{3}{x-1} - \frac{2}{x+1} \leq 1$
60. $\frac{2}{x+5} - \frac{3}{x+3} \leq \frac{1}{x}$

Solve by graphing the associated function.

61. $x^2 - 8x + 15 > 0$
62. $x^2 - 14x + 45 \geq 0$
63. $x^2 - 6x + 9 \leq 0$
64. $x^2 - 2x - 35 < 0$
65. $2x^2 - 4x + 5 \geq 0$
66. $3x^2 \leq 6x + 1$
67. $\frac{1}{x-1} + 1 > 0$
68. $\frac{1}{x-2} - 3 \leq 0$
69. $\frac{x-1}{x+2} \leq 0$
70. $\frac{x-2}{x+3} \geq 0$
71. $\frac{x+1}{x-1} \geq 0$
72. $\frac{2x-1}{x-4} \leq 0$

$$\frac{3}{x-1} - \frac{2}{x+1} \leq 1$$

$$\frac{3(x+1) - 2(x-1) - (x-1)(x+1)}{(x-1)(x+1)}$$

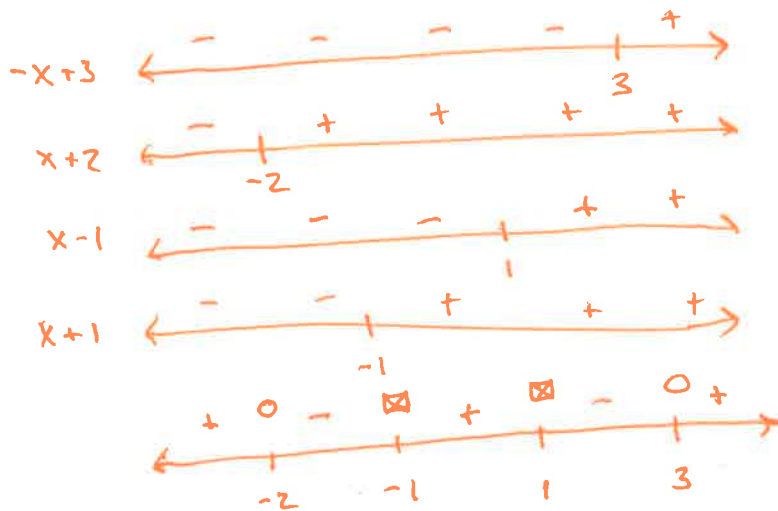
$$\frac{3x+3-2x+2-x^2+1}{(x-1)(x+1)}$$

$$-x^2+x+6$$

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

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

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



$$[-2, -1) \cup (1, 3]$$