SOLVE FRACTIONAL INEQUALITIES WITH NEGATIVES

Answer all of these questions. Remember to show your working out in all questions.

MAIN QUESTIONS

1. $1/x < 2$ | $x < 0$ or $x > 1/2$

2. $-1/x > 3$ | $-1/3 < x < 0$

3. $2/(x-1) \leq -1$ | $x < 1$ or $x \geq -1$

4. $-3/(x+2) > 2$ | $-7/2 < x < -2$

5. $1/(2x) \geq -4$ | $x < 0$ or $x \geq -1/8$

6. $-2/(3x) < 1$ | $x < -2/3$ or $x > 0$

7. $(x+1)/(x-2) > 0$ | $x < -1$ or $x > 2$

8. $(x-3)/(x+1) \leq 0$ | $-1 < x \leq 3$

9. $(-x+2)/(x-4) \geq 0$ | $2 \leq x < 4$

10. $(-2x+1)/(x+3) < 0$ | $x < -3$ or $x > 1/2$

11. $3/(x-1) + 1/(x+2) > 0$ | $x < -2$ or $-1/4 < x < 1$ or $x > 1$

12. $2/(x+1) - 1/(x-3) \leq 0$ | $x < -1$ or $1 \leq x < 3$

13. $(x^2-4)/(x+3) > 0$ | $x < -3$ or $-2 < x < 2$ or $x > 2$

14. $(x^2-9)/(x-1) \leq 0$ | $x \leq -3$ or $1 < x \leq 3$

15. $(-x^2+1)/(x+2) \geq 0$ | $x < -2$ or $-1 \leq x \leq 1$

16. $(2x-1)/(x^2-4) < 0$ | $x < -2$ or $1/2 < x < 2$

17. $\frac{(x+3)}{(x^2-1)} \geq 0$ | $x < -3$ or $-1 < x < 1$ or $x \geq 1$

18. $\frac{(-x-2)}{(x^2-9)} > 0$ | $-3 < x < -2$ or $x > 3$

19. $\frac{1}{(x-2)} + \frac{2}{(x+1)} < 1$ | $x < -1$ or $2 < x < 5$

20. $\frac{3}{(x+2)} - \frac{1}{(x-1)} \geq 2$ | $-2 < x \leq -1$ or $x > 1$

21. $\frac{(2x+1)}{(x-3)} - \frac{(x-2)}{(x+1)} > 0$ | $x < -1$ or $-1/3 < x < 3$ or $x > 3$

22. $\frac{(x+4)}{(x-2)} + \frac{(x-1)}{(x+3)} \leq 1$ | $-3 < x \leq -1$ or $2 < x \leq 5$

23. $\left|\frac{1}{x}\right| > 2$ | $-1/2 < x < 0$ or $0 < x < 1/2$

24. $\left|\frac{(x-1)}{(x+2)}\right| \leq 3$ | $x \leq -7/2$ or $x \geq -5/4$, $x \neq -2$

25. $|2/(x-3)| < 1$ | $x < 1$ or $x > 5$

26. $\left|\frac{(-x+2)}{(x+1)}\right| \geq 2$ | $x \leq -4$ or $x \geq 0$, $x \neq -1$

27. $\frac{(x^2-1)}{(x+2)^2} > 0$ | $x < -2$ or $-2 < x < -1$ or $x > 1$

28. $\frac{(x-3)^2}{(x+1)} \leq 0$ | $x = 3$ or $x < -1$

29. $\frac{(-x^2+4)}{(x-1)^2} \geq 0$ | $-2 \leq x \leq 2$, $x \neq 1$

30. $\frac{(2x+1)^2}{(x^2-4)} < 0$ | $-2 < x < 2$, $x \neq -1/2$

MASTER QUESTIONS

M1. A chemical reaction rate R is given by $R = k/(T+273)$ where k is a constant and T is temperature in °C. For the reaction to proceed at a rate greater than 0.01k, find the temperature range.

$T < -263°C$ or $T > 27°C$

M2. The efficiency E of a machine is modelled by $E = (100-P)/(P+20)$ where P is power input in watts. Find when efficiency exceeds 50%.

$P < 20$ watts

M3. A car's fuel consumption C in litres per 100km is given by $C = 8 + 12/(v-40)$ where v is speed in km/h. Determine speeds where consumption is less than 10 litres/100km.

$40 < v < 100$ km/h

M4. The profit P in thousands of pounds for a company is $P = (x-50)/(x+10)$ where x is units sold in hundreds. Find when profit is negative.

$10 < x < 50$ hundred units

M5. A spring's extension e in cm under load L kg is $e = 5L/(L-2)$. Find loads where extension exceeds 10cm.

$2 < L < 4$ kg

M6. The concentration C of a drug in mg/litre over time t hours is $C = 20t/(t^2-4)$. Determine when concentration is below 2mg/litre.

$t < -\sqrt{24}$ or $-2 < t < 2$ or $t > \sqrt{24}$ hours

M7. A population growth rate r is given by $r = (N-1000)/(N+500)$ where N is population size. Find when growth rate is positive.

$N < -500$ or $N > 1000$

M8. The pressure P in kPa in a container is $P = 150/(T-293)$ where T is temperature in Kelvin. Find temperatures where pressure is less than -30kPa.

$288 < T < 293$ K

M9. A beam's deflection d in mm under load w kg is $d = (w^2-16)/(w-4)$. Find loads where deflection is positive.

$w < -4$ or $w > 4$ kg, $w \neq 4$

M10. The cost per unit C in pounds is C = (2x+10)/(x-5) where x is production units in thousands. Determine production levels where cost per unit is less than £3.

$5 < x < 25$ thousand units