Block 1: Algebraic expressions, polynomials

Problem 1: Simplify:

a) $\left(1-\frac{2}{a+1}\right):\frac{a-1}{a^2-1}$

b) $(a^3b^4c^5):(-a^3c^2)$

c) $\left(\frac{3}{1+a}-1\right)\cdot\left(\frac{3}{2-a}-1\right)$

d) $\left(\frac{a^{-2}\cdot b^4\cdot c^{-3}}{b\cdot c^2\cdot a^{-2}}\right)^{-2}$

e) $\frac{1+\frac{1}{x-1}}{1-\frac{1}{x+1}}$

f) $\left(\frac{x^2-y^2}{3x^2y^2}\right):\left(\frac{1+2x}{x}-\frac{2y-1}{y}\right)$

g) $\left(\frac{1}{(a-b)^2}-\frac{1}{(a-b)^2+4ab}\right):\frac{ab}{a^2-b^2}$

h) $\left[\left(\frac{x}{y}\right)^2-\frac{x}{y^2}\right]:\left(\frac{x-1}{y}\right)^2$

Problem 2: Solve the equation:

a) $x^2+x-1=2x^2-1$

b) $2x^2-2x+1=x^2-2x$

c) $2x^2-12x+36=x^2+2x-13$

Problem 3: Sketch a graph of a function:

a) $y=2x-3$

b) $y=-x^2+2x$

c) $y=x^2+2x+3$

d) $y=x^2+4x+4$

Block 2: Absolute value, rational and irrational functions

Problem 1: Sketch a graph of a function:

a) $y = |x + 1| - |1 - x|$

b) $y = x^2 - x|x - 2| - 4$

Problem 2: Solve the equation:

a) $x^2 + 2|x - 1| - 6 = 0$

b) $|2x + 1| - |2x| + 1 = 2x$

Problem 3: Solve in $\mathbb{R}$:

a) $\frac{1}{x} < 1$

b) $\frac{1-3x}{x+4} < 2,$

c) $\frac{5-x}{x-1} + \frac{1+4x}{2x+2} \leq 1,$

d) $\sqrt{x-3} - \sqrt{2x+5} = 0$

e) $1 + \sqrt{x+1} = 2x$