Precalculus Unit 1 worksheet: Polynomial and rational inequalities with sign charts

Name _____ Date _____ Period _____

1. Let $f(x) = -x(x-3)^2(x+5)$. Make one sign chart for f, then use it to solve all four inequalities. Write each answer in interval notation.

(a) $f(x) > 0$ (b) $f(x) \geq 0$ (c) $f(x) < 0$ (d) $f(x) \leq 0$

2. Move every term to one side and factor completely, then solve with a sign chart. In (c), find a whole-number zero first.

(a) $2x^3 + 6x^2 < 8x$ (b) $x^3 + 2x^2 - 4x - 8 \geq 0$ (c) $x^3 - 7x + 6 < 0$

3. Solve each inequality. Write it as one fraction compared with 0 first, and say which critical numbers make the expression undefined.

(a) $\dfrac{x^2}{x-2} \leq x + 1$ (b) $\dfrac{1}{x} + \dfrac{1}{x-2} \geq 0$ (c) $\dfrac{x^2-4}{x^2-x-2} \geq 0$

4. Solve $(x+6)^2(x-2)(x-7) \leq 0$. Write the answer in interval notation.

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5. Samir solves $x^3 > 9x$ like this: "Divide both sides by x to get $x^2 > 9$, so the answer is $(-\infty, -3) \cup (3, \infty)$."

(a) Solve $x^3 > 9x$ correctly with a sign chart.

(b) Which numbers does Samir's answer wrongly include, and which solutions does it miss?

(c) Explain which step went wrong and why.

6. A mixing tank at a paint store holds 16 liters of paint, and 4 liters of it are blue tint. The clerk pours in x liters of pure blue tint, so the fraction of the paint that is blue becomes $\dfrac{4 + x}{16 + x}$. How much tint must be added for blue to make up at least $\dfrac{1}{3}$ of the paint? Solve the inequality with a sign chart.

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