Rational FUNction Example 01

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Your Personal Mathematics Trainer
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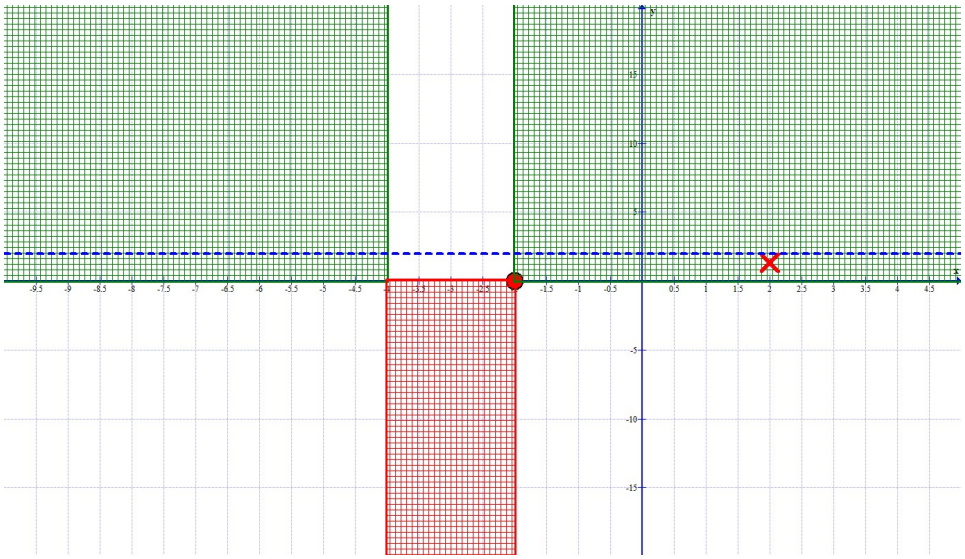
$$\mathbf{r}(\mathbf{x}) = \frac{2\mathbf{x}^2 - 8}{\mathbf{x}^2 + 2\mathbf{x} - 8}$$
$$= \frac{2(\mathbf{x}^2 - 4)}{(\mathbf{x}+4)(\mathbf{x}-2)}$$
$$= \frac{2(\mathbf{x}-2)(\mathbf{x}+2)}{(\mathbf{x}+4)(\mathbf{x}-2)}$$
$$= \frac{2(\mathbf{x}+2)}{\mathbf{x}+4} \; ; \; \mathbf{x} \neq -2$$

1. **Dom r** $= \mathbb{R}_x \setminus \{-4, 2\}$
2. Intercept POINTS:
   a. y-intercept point: $\mathbf{r}(0) = 1 \Rightarrow (0,1)$
   b. x-intercept point: $\mathbf{r}(\mathbf{x}) \overset{\text{Set}}{=} 0 \Rightarrow \mathbf{x} = -2 \Rightarrow (-2,0)$ is an x-intercept point
3. Continuity:
   a. Hole: At x = 2 … common factor
   b. Vertical Asymptote: y = -4 … not a common factor



$$\mathbf{Posp} = (-\infty,-4) \cup (-2,2) \cup (2,+\infty) \; ; \; \mathbf{Negp} = (-2,-2)$$

4. Behavior to/toward $\pm\infty$

a. $\mathbf{x} \to +\infty \Rightarrow \mathbf{r}(\mathbf{x}) = \dfrac{2\mathbf{x}+4}{\mathbf{x}+4} = \dfrac{2+\frac{4}{\mathbf{x}}}{1+\frac{4}{\mathbf{x}}} \to 2 = \dfrac{2}{1} = \dfrac{\mathbf{a}_1}{\mathbf{b}_1}$

b. $-\infty \leftarrow \mathbf{x} \Rightarrow \mathbf{r}(\mathbf{x}) = \dfrac{2\mathbf{x}+4}{\mathbf{x}+4} = \dfrac{2+\frac{4}{\mathbf{x}}}{1+\frac{4}{\mathbf{x}}} \to 2 = \dfrac{2}{1} = \dfrac{\mathbf{a}_1}{\mathbf{b}_1}$

5. Symmetry: Neither Even nor Odd
6. Graph: