

Beurling Academy
November 2012
Mathematics—Cycle 2, Year 2 (SCI)
Test #3: Rational expressions/quadratic equations & inequalities

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Date: Nov 8, '12

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1

Perform the given operations, given that the variables do not take values that make the denominators zero, i.e. you do not have to state the restrictions.

a) $\left(\frac{2x^2}{y}\right)\left(\frac{y}{2x}\right)^2$

$\frac{2x^2 \cdot y^2}{y \cdot 2x} = \frac{2x^2y^2}{2xy} = xy$

0/2

b) $\frac{2x-6}{x^2-x-6} + \frac{x}{x+2}$

$\frac{2x-6}{(x-3)(x+2)} + \frac{x}{x+2} =$

$\frac{2x-6}{(x-3)(x+2)} + \frac{x(x-3)}{(x+2)(x-3)} = \frac{2x-6 + x^2-3x}{(x+2)(x-3)}$

2/2

Perform the given operations and state restrictions.

$= \frac{x^2-x-6}{(x+2)(x-3)} = \frac{(x+2)(x-3)}{(x+2)(x-3)} = 1$

c) $\frac{2x-4}{x+2} - \frac{x-2}{x}$

$\frac{(2x-4)(x)}{(x+2)(x)} - \frac{(x-2)(x+2)}{x(x+2)} = \frac{2x^2-4x - x^2-4}{x(x+2)}$

$= \frac{x^2-4x-4}{x(x+2)}$ ✓ restrictions?

3/4

2

Solve the following equations.

1/2

a) $2x^2 - 32 = 0$ $x^2 = \sqrt{16}$
 $2x^2 = 32$ $x = 4$
 $x^2 = \frac{32}{2}$

2/2

b) $x^2 + 4x = 21$ $x_1, x_2 = -7, 3$
 $x^2 + 4x - 21 = 0$
 $(x + 7)(x - 3)$
 $x = -7$ $x = 3$

1/2

c) $(2x+1)^2 = (x+4)^2$
 $(2x+1)(2x+1) = (x+4)(x+4)$
 $4x^2 + 2x + 1 = x^2 + 8x + 16$
 $3x^2 - 6x - 15 = 0$ $x_1, x_2 = -1, 5$

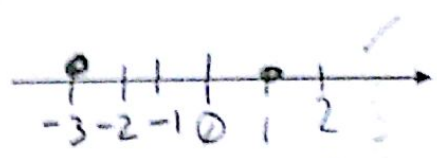
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3

Solve the following inequality. Express your solution on the number line and in interval notation.

2/4

$2(x+1)^2 - 8 > 0$
 $2(x^2 + 2x + 1) - 8 > 0$
 $2x^2 + 4x + 2 - 8 > 0$
 $2x^2 + 4x - 6 > 0$
 $2(x^2 + 2x - 3) > 0$
 $2(x+3)(x-1)$
 $x+3=0$ $x-1=0$
 $x_1 = -3$ $x_2 = 1$

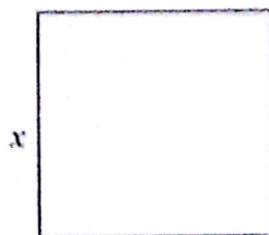
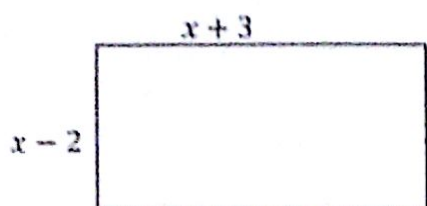


$f(x) = 2(x+1)^2 - 8 > 0$
 $f(-3) = 2(-3+1)^2 - 8 = 0$
 $f(0) = 2(0+1)^2 - 8 < 0$
 $f(2) = 2(2+1)^2 - 8 > 0$

$]2, \infty[$

4

The rectangle and square below are equivalent (they have the same area). What are their dimensions?



$$(x+3)(x-2) = x^2 \quad \checkmark$$

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

$$x - 6 = 0$$

$$x = 6$$

Dimensions of the square: 6² $L+W=6$

Dimensions of the rectangle: 9x4 $L=9$
 $w=4$

Two brothers were born one year apart. The product of their ages is less than 110. In what interval can their ages be?

$$(x+1)(x) < 110 \checkmark$$

$$x^2 - x < 110$$

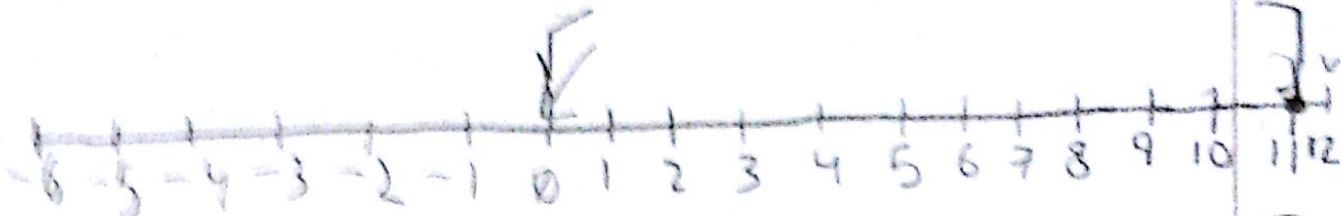
$$x^2 - x - 110 = 0$$

$$(x-11)(x+10) = 0$$

$$\downarrow \quad \downarrow$$

$$x-11=0 \quad x+10=0$$

$$x=11 \quad x=-10$$



$$f(x) = x^2 - x < 110$$

$$f(-1) = 1 - (-1) > 110$$

$$f(0) = 0 - 0 = < 110$$

$$f(12) = 144 - 12 > 110$$

$$]0, 10]$$

$$]0, 11]$$

The younger brother's age can be in the interval $]0, 10]$

The older brother's age can be in the interval $]0, 11]$

Formulas you may wish to use:

$$x_1, x_2 = h \pm \sqrt{-\frac{r}{a}}$$

$$x_1, x_2 = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$