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Note Title 8/19/2010

Polynomials:

a) $2x^2 + x + 1$ $n = 2$ degree

$a_2 = 2$

$a_1 = 1$

$a_0 = 1$

$a_2x^2 + a_1x + a_0$

b) $10x^5 + x^4 - 2x^3 - 20$

$n = 5$

$a_5 = 10,\ a_4 = 1,\ a_3 = -2,\ a_2 = 0,\ a_1 = 0,\ a_0 = -20$

c) $x^{10} + x^9 - x^{1/2} + 3$ NO

d) $0.1\,x^3 - 10 \cdot 2^5$ YES

Rational expressions:

$\frac{2x^2+3}{x-1}$ ✓ YES

$\frac{x+3}{x+5}$ ✓

$\frac{x}{x-5}$ Yes

$\frac{1}{x+7}$

$$\frac{x+3}{x+5} + \frac{1}{x+7} = 0$$ Rational equation

Example

$$\frac{2}{3x} + \frac{1}{2} = \frac{4}{x} + \frac{4}{3}$$

$$x \neq 0$$

multiply both sides by $6x$

$$6x\left(\frac{2}{3x} + \frac{1}{2}\right) = 6x\left(\frac{4}{x} + \frac{4}{3}\right)$$

x	$\frac{1}{x}$
1	1
0.1	10
0.01	100
0.001	1000
↓	↓
smaller & smaller	bigger & bigger

$$\overset{2}{\cancel{6x}}\left(\frac{2}{\cancel{3x}_{1}}\right) + \overset{3}{\cancel{6x}}\left(\frac{1}{\cancel{2}_{1}}\right) = \cancel{6x}\left(\frac{4}{\cancel{x}}\right) + \overset{2}{\cancel{6}}x\left(\frac{4}{\cancel{3}_{1}}\right)$$

$$4 + 3x = 24 + 8x$$

$$\underline{\quad -24 \quad} \qquad \underline{\quad -24 \quad}$$

$$-20 + 3x = 8x$$

$$-20 + 3x - 3x = 8x - 3x$$

$$\frac{-20}{5} = \frac{5x}{5}$$

$$\boxed{-4 = x}$$

Example (5)

$$\frac{3x}{x-1} + 2 = \frac{3}{x-1} \qquad x \neq 1$$

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

$$3x + 2x - 2 = 3$$

$$5x - 2 = 3$$

$$5x - 2 + 2 = 3 + 2$$

$$\frac{5x}{5} = \frac{5}{5}$$

$$x = 1$$

NO SOLUTION.

Example

$$\frac{1}{3x+18} - \frac{1}{2x+12} = \frac{1}{x^2+6x}$$

Factor the denominators

$$\frac{1}{3(x+6)} - \frac{1}{2(x+6)} = \frac{1}{x(x+6)} \qquad \begin{matrix} x \neq -6 \\ x \neq 0 \end{matrix}$$

multiply both sides by $6x(x+6)$

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

$$2x - 3x = 6$$

$$-x = 6$$

$$x = -6$$

NO SOLUTION.

Example

Test scores 82, 79, 90

find exam grade $= x$.

want: average $= 85$

$$\frac{82 + 79 + 90 + 2x}{5} = 85$$

$$\frac{251 + 2x}{5} = 85$$

$$251 + 2x = 5(85)$$

$$251 + 2x = 425$$

$$2x = 425 - 251$$

$$\frac{2x}{2} = \frac{174}{2}$$

$$\boxed{x = 87}$$