> # **Альромхин Джорж, гр.858301, Лаб 1**

 # task 1.10 —Simplify the algebraic expression
 # Упростите алгебраическое выражение.

> $simplify\left(\dfrac{\dfrac{x^3-3\cdot x-2}{x^2+40\cdot x+400}}{\dfrac{x^4+x^3-3\cdot x^2-5\cdot x-2}{9\cdot x^3-351\cdot x^2+3240\cdot x+3600}}\right)$

$$\frac{9\,(x-20)^2}{(x+20)^2} \tag{1}$$

> *# task 2.10 — Bring the expression to a polynomial of the standard form*
#Приведите выражение к многочлену стандартного вида.

> $expand((3\cdot x-8)\cdot(2\cdot x^2+3)\cdot(4\cdot x+5))$

$$24\,x^4-34\,x^3-44\,x^2-51\,x-120 \tag{2}$$

> *# task 3.10 - Decompose the polynomial into multipliers*
#Разложите многочлен на множители.

> $factor(x^4-16\cdot x^3+67\cdot x^2-64\cdot x+252)$

$$(x-7)\,(x-9)\,(x^2+4) \tag{3}$$

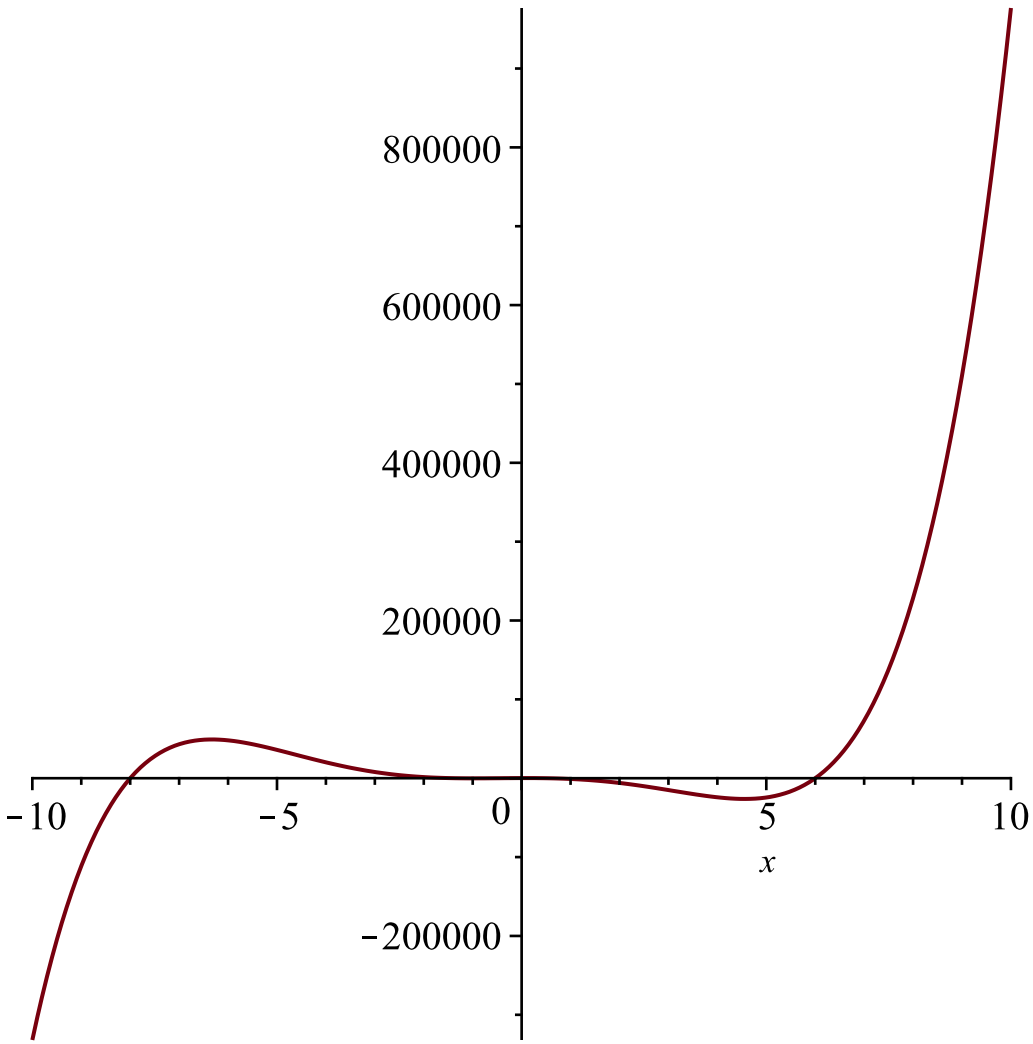
> *# task 4.10 — Plot a polynomial and find all its roots*
#Постройте график многочлена и найдите все его корни.

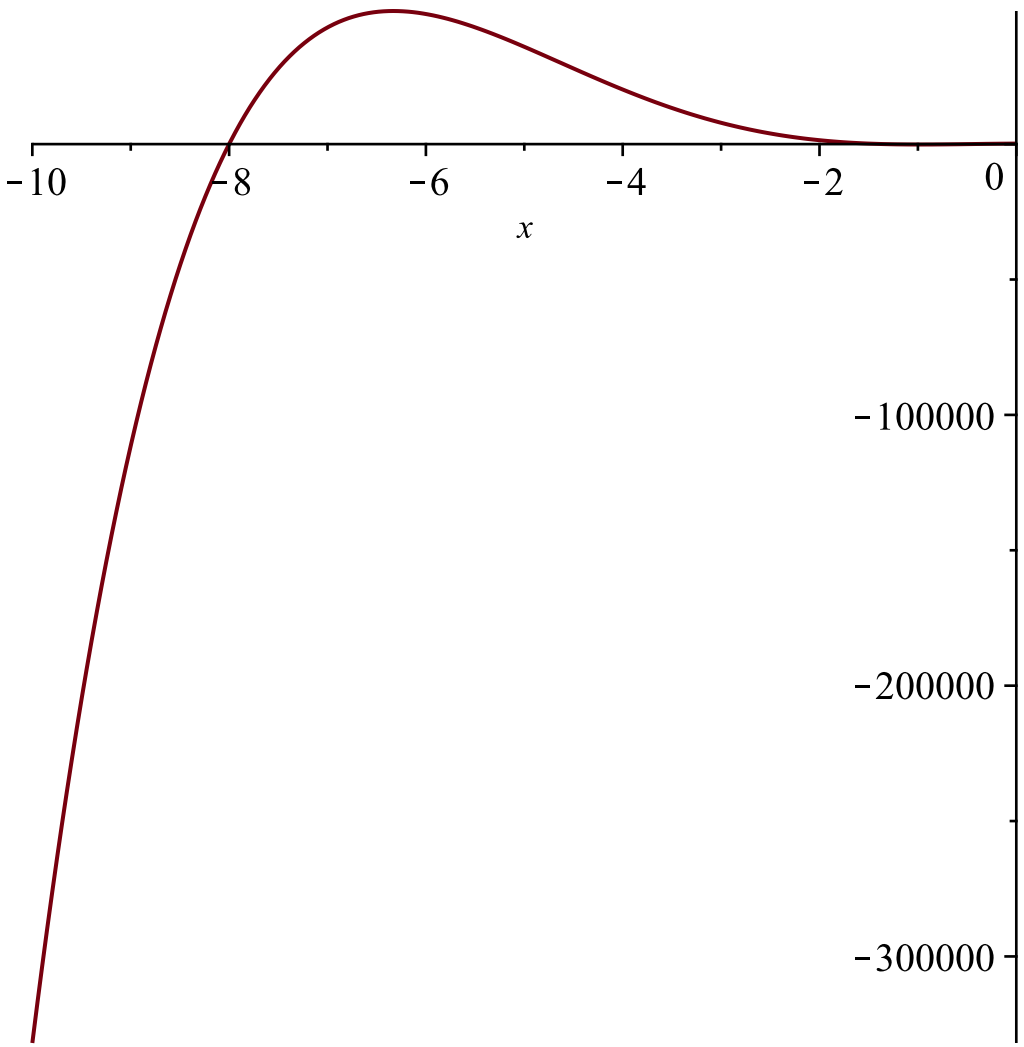
> $f := 12\cdot x^5+40\cdot x^4-547\cdot x^3-778\cdot x^2+136\cdot x+192:$

> $fsolve(f)$

$$-8.,\ -1.333333333,\ -0.5000000000,\ 0.5000000000,\ 6. \tag{4}$$

> $plot(f); plot(f, x=-10..0)$


800000
600000
400000
200000
-200000
-10
-5
0
5
10
x



> # task 5.10 —Decompose the rational fraction into the sum of the simplest fractions
Разложите рациональную дробь на сумму простейших дробей.

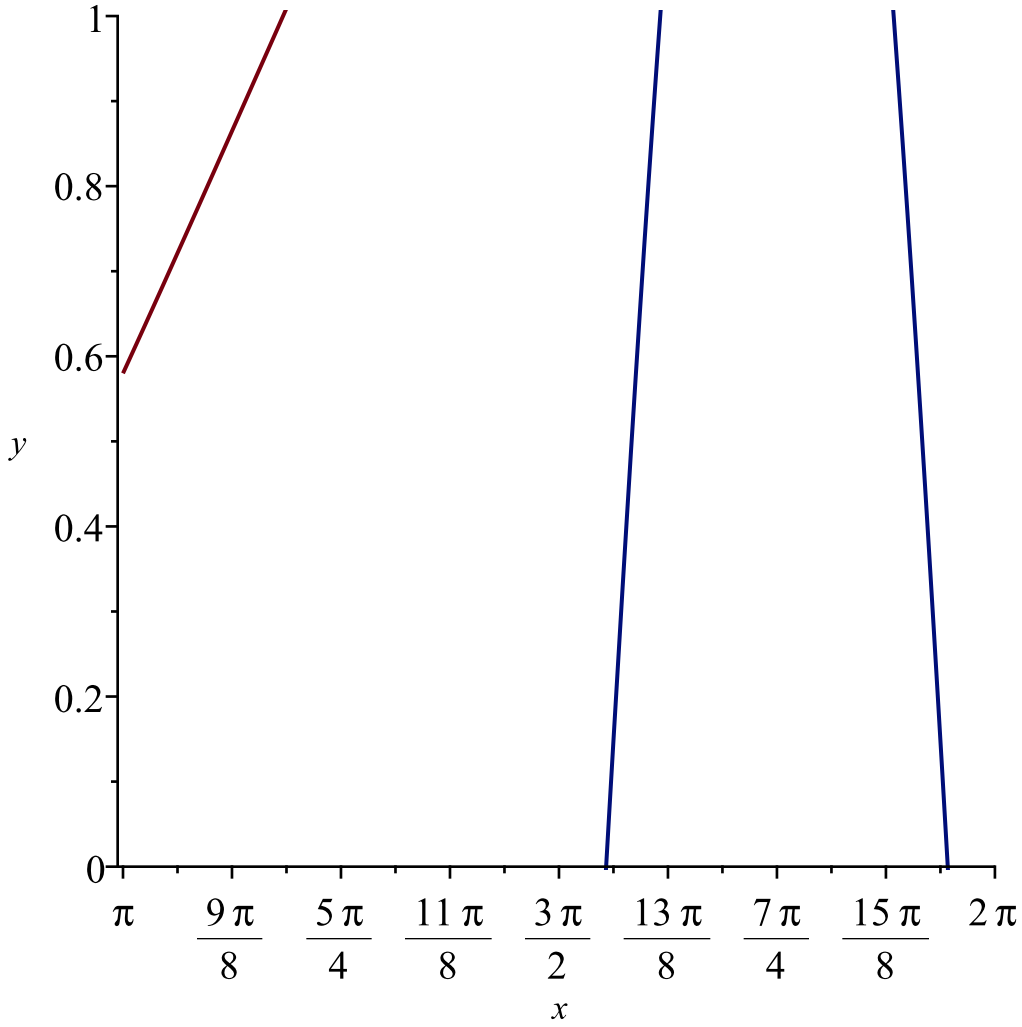
> $convert\left(\frac{4\cdot x^4+3\cdot x^3+2\cdot x-5}{(x^2+1)\cdot(x-3)^2\cdot(x^2-4)}, parfrac\right)$

$$-\frac{31}{500\,(x+2)}+\frac{203}{25\,(x-3)^2}+\frac{87}{20\,(x-2)}+\frac{7x+1}{250\,(x^2+1)}-\frac{1079}{250\,(x-3)} \quad \textbf{(5)}$$

> # task 6.10 — Solve graphically the equation and find its approximate roots with an accuracy of 10^{-5}

#Решите графически уравнение и найдите его приближенные корни с точностью до 10^{-5}.

> $plot\left(\left[\ln^2(x-1), -3\cdot\sin(2\cdot x) - 1\right], x=\pi..2\,\pi, y=0..1\right)$



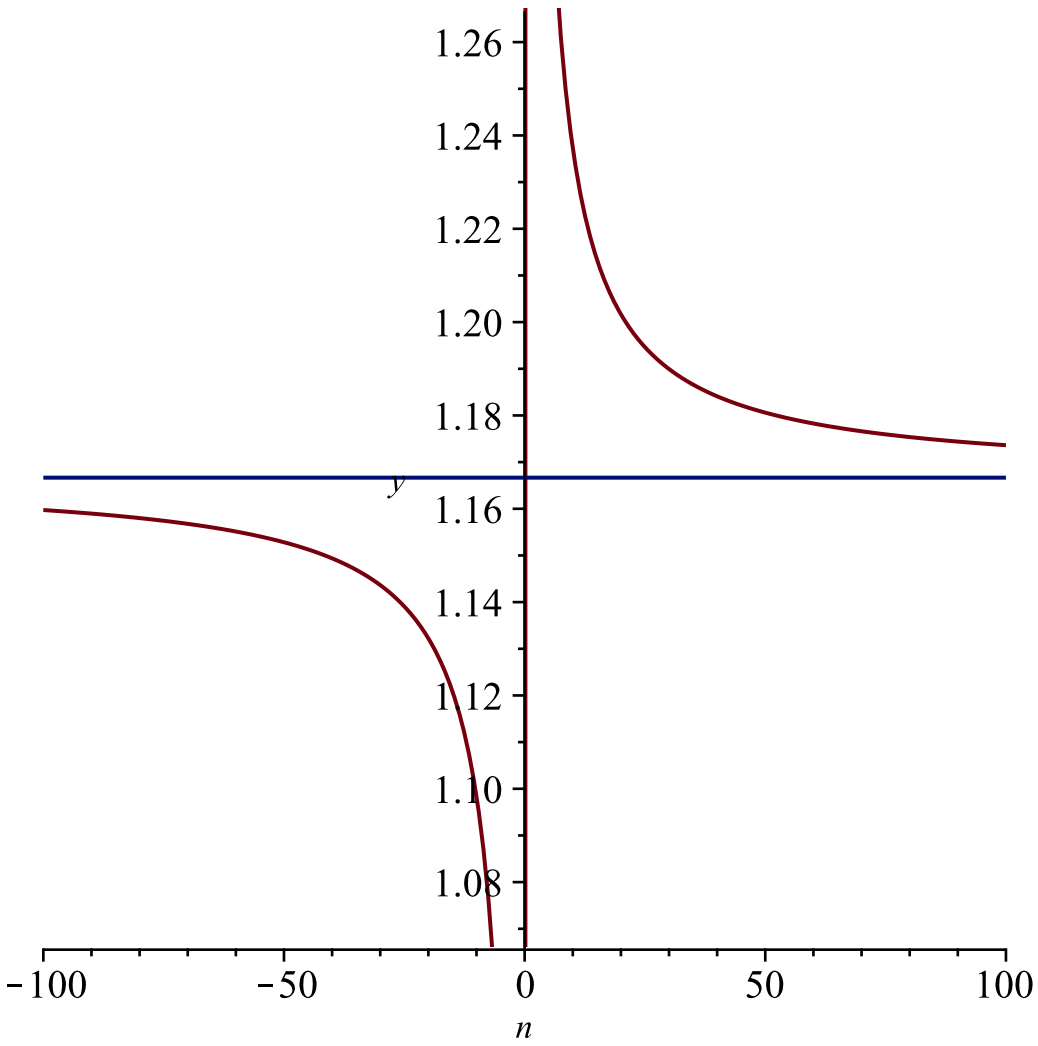
> # task 7.10 Prove that by defining the number from which all members of the sequence fall in the-neighborhood of point a. Illustrate the result with a draw-ing in Maple by putting .

> $an := \frac{7 \cdot n + 3}{6 \cdot n - 1}$:

> $limit\left(\frac{7 \cdot n + 3}{6 \cdot n - 1}, n = \infty \right)$

$$\frac{4}{3} \qquad \textbf{(6)}$$

> $plot\left(\left[\frac{7 \cdot n + 3}{6 \cdot n - 1}, \frac{7}{6} \right], n = -100 \ldots 100, y = \frac{7}{6} - 0.1 \ldots \frac{7}{6} + 0.1 \right)$




```
> # task 8.10 – Calculate the limits of numerical sequences
  #Вычислите пределы числовых последовательностей.
```

```
> limit((sqrt(n+2))·(sqrt(n+3) - sqrt(n-4)), n=∞)
```

$$\frac{7}{2} \tag{7}$$

```
> limit(((3·n^2+6·n-1)/(3·n^2-2·n+4))^(1-3n), n=infinity)
```

$$e^{-8} \tag{8}$$

```
> # task 9.10
> y1 := 2·cos(2·x):
> y2 := 4·e^(-0.2·x):
> y := { 2·cos(2·x)   x < -π
       { 4·e^(-0.2·x)  x ≥ -π
```

$$y := \begin{cases} 2\cos(2x) & x < -\pi \\ 4\,e^{-0.2x} & -\pi \le x \end{cases} \tag{9}$$

> $plot\left(\begin{cases} 2\cdot\cos(2\cdot x) & x < -\pi \\ 4\cdot e^{-0.2\cdot x} & x \geq -\pi \end{cases}\right)$