

Системы аналитических вычислений.

Лабораторная работа №5.

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```
In[78]:= Clear[f, g, x, stdExgcd]
f := 12 * x^7 - 168 * x^5 + 288 * x^3 + 324 * x;
g := 4 * x^6 - 28 * x^4 + 20 * x^3 + 48 * x^2 - 60 * x;
stdExgcd = PolynomialGCD[f, g] / 4 // ExpandAll;
```

Standard algorithm:

```
In[68]:= Print[stdExgcd]
- 3 x + x^3
```

Расширенный алгоритм Евклида:

```
In[82]:= exgcd[aa_, bb_] := Module[
  {a = aa, b = bb,
   u = 1, u1 = 0,
   v = 0, v1 = 1,
   quot, rem
  },

  While[Not[SameQ[b, 0]],
    quot = PolynomialQuotient[a, b, x];
    rem = PolynomialRemainder[a, b, x];
    {a, b} = {b, rem};
    {u, u1} = {u1, (u - u1 * quot) // ExpandAll};
    {v, v1} = {v1, (v - v1 * quot) // ExpandAll};

  ];
  {a, u, v} (* a - НОД *)
];

{gcd, u, v} = exgcd[f, g];
```

```
Out[243]= {  $\frac{17689}{13689} - \frac{7105x}{27378} - \frac{49x^2}{234}$ ,  $-\frac{39200}{4563} - \frac{75509x}{9126} + \frac{7105x^2}{9126} + \frac{49x^3}{78}$ ,  $\frac{1420804x}{1521} - \frac{1420804x^3}{4563}$  } [3]
```

```
coef = CoefficientList[gcd, x] // Last
```

```
Out[24]= -  $\frac{1420804}{4563}$ 
```

Нормализация:

```
In[84]:= gcdNorm = (gcd / coef) // ExpandAll
uNorm = (u / coef) // ExpandAll
vNorm = (v / coef) // ExpandAll
```

```
Out[84]= -3 x + x^3
```

```
Out[85]= -\frac{361}{86988} + \frac{145 x}{173976} + \frac{39 x^2}{57992}
```

```
Out[86]= \frac{200}{7249} + \frac{1541 x}{57992} - \frac{145 x^2}{57992} - \frac{117 x^3}{57992}
```

```
Out[44]= 4 \times (-3 x + x^3)
```

Проверка:

```
In[87]:= SameQ[stdExgcd, gcdNorm]
```

```
Out[87]= True
```

```
In[88]:= bezout = (uNorm * f + vNorm * g) // ExpandAll
```

```
Out[88]= -3 x + x^3
```

```
In[89]:= SameQ[bezout, gcdEuclidNorm]
```

```
Out[89]= True
```