

Лабораторная работа 5

```
In[47]:= 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
```

Функция для получения НОД и коэффициентов разложения Безу

```
In[49]:= mygcd[poly1_, poly2_] :=
Module[
  {p1 = poly1, p2 = poly2, xval = 1, xxval = 0, yval = 0, yyval = 1, q, r},
  While[
    Length[CoefficientList[p2, x]] ≠ 0,
    q = PolynomialQuotient[p1, p2, x];
    r = PolynomialRemainder[p1, p2, x];
    {p1, p2} = {p2, r};
    {xval, xxval} = {xxval, (xval - xxval * q) // ExpandAll};
    {yval, yyval} = {yyval, (yval - yyval * q) // ExpandAll};

  ];
  {xval, yval, p1}
];
```

```
In[50]:= {u, v, gcd} = mygcd[f, g];
"u =" u
"v =" v
"gcd =" gcd
```

$$\text{Out[51]}= u = \left(\frac{17\,689}{13\,689} - \frac{7105\,x}{27\,378} - \frac{49\,x^2}{234} \right)$$

$$\text{Out[52]}= v = \left(-\frac{39\,200}{4563} - \frac{75\,509\,x}{9126} + \frac{7105\,x^2}{9126} + \frac{49\,x^3}{78} \right)$$

$$\text{Out[53]}= \text{gcd} = \left(\frac{1\,420\,804\,x}{1521} - \frac{1\,420\,804\,x^3}{4563} \right)$$

Нормирование - вычисление старшего коэффициента и деление на него
Нормируем найденный gcd:

```
In[54]:= k1 = CoefficientList [gcd, x] // Last
gcdNorm = (gcd / k1) // ExpandAll
uNorm = (u / k1) // ExpandAll
vNorm = (v / k1) // ExpandAll
```

$$\text{Out[54]} = -\frac{1\,420\,804}{4563}$$

$$\text{Out[55]} = -3x + x^3$$

$$\text{Out[56]} = -\frac{361}{86\,988} + \frac{145x}{173\,976} + \frac{39x^2}{57\,992}$$

$$\text{Out[57]} = \frac{200}{7249} + \frac{1541x}{57\,992} - \frac{145x^2}{57\,992} - \frac{117x^3}{57\,992}$$

Нормируем gcd, встроенный в wolfram:

```
In[58]:= wolframgcd = PolynomialGCD[f, g]
```

$$\text{Out[58]} = -12x + 4x^3$$

```
In[59]:= k2 = CoefficientList [wolframgcd, x] // Last
wolframgcdNorm = (wolframgcd / k2) // ExpandAll
```

$$\text{Out[59]} = 4$$

$$\text{Out[60]} = -3x + x^3$$

Сравним результаты, полученный встроенной функцией и моей:

```
In[61]:= SameQ[wolframgcdNorm, gcdNorm]
```

$$\text{Out[61]} = \text{True}$$

Проверяем тождество Безу:

```
In[62]:= wolframgcdNorm == (uNorm * f + vNorm * g) // ExpandAll
```

$$\text{Out[62]} = \text{True}$$