

## Практическое занятие 2.1

Найти изображения функций

(I) с помощью свойств преобразования Лапласа      (II) с помощью Maple

### Задание 1

- |  |  |
|--|--|
| 1) $f(t) = 21 + 65t^4 + 36e^{5t} + 63\sin 3t;$               | 2) $f(t) = 81 + 32t^5 - 46e^{-6t} - 54\cos 2t;$              |
| 3) $f(t) = 61 - 66t^4 + 35e^{-2t} + 45\operatorname{sh} 4t;$ | 4) $f(t) = 41 + 56t^3 + 48e^{6t} + 36\operatorname{ch} 3t;$  |
| 5) $f(t) = 71 + 23t^2 - 60e^{9t} - 37\sin 7t;$               | 6) $f(t) = 22 + 13t^2 - 02e^{-4t} + 68\cos 2t;$              |
| 7) $f(t) = 34 - 64t^4 + 91e^{6t} + 69\operatorname{sh} 6t;$  | 8) $f(t) = 67 + 35t^5 - 83e^{8t} + 52\operatorname{ch} 8t;$  |
| 9) $f(t) = 78 - 16t^3 + 47e^{2t} - 56\sin 9t;$               | 10) $f(t) = 45 + 32t^2 - 78e^{-6t} + 53\cos 2t;$             |
| 11) $f(t) = 77 + 86t^3 + 49e^t + 48\operatorname{sh} 5t;$    | 12) $f(t) = 48 - 23t^2 + 22e^{4t} + 42\operatorname{ch} 4t;$ |
| 13) $f(t) = 86 + 33t^4 + 17e^{-t} - 43\cos 6t;$              |  |

### Задание 2

- |  |  |                                     |                                    |  |
|--|--|-------------------------------------|------------------------------------|--|
| 1) $f(t) = e^{9t} \cdot t^4;$                    | 2) $f(t) = e^{2t} \cdot t;$                      | 3) $f(t) = e^{3t} \cdot t^5;$       | 4) $f(t) = e^{4t} \cdot t^3;$      | 5) $f(t) = e^{5t} \cdot t^4;$                    |
| 6) $f(t) = e^{7t} \cdot t^3;$                    | 7) $f(t) = e^{6t} \cdot t^2;$                    | 8) $f(t) = e^{-t} \cdot t^3;$       | 9) $f(t) = e^{-2t} \cdot \sin 7t;$ | 10) $f(t) = e^{-3t} \cdot \operatorname{ch} 5t;$ |
| 11) $f(t) = e^{-4t} \cdot \operatorname{sh} 6t;$ | 12) $f(t) = e^{-5t} \cdot \operatorname{ch} 9t;$ | 13) $f(t) = e^{-6t} \cdot \sin 3t;$ |                                    |  |

### Задание 3

- |   |   |  |   |  |
|---|---|--|---|--|
| 1) $f(t) = t \cdot \operatorname{sh} 6t;$ | 2) $f(t) = t \cdot \operatorname{ch} 6t;$ | 3) $f(t) = t \cdot \cos 7t;$               | 4) $f(t) = t \cdot \sin 7t;$              | 5) $f(t) = t \cdot \operatorname{sh} 7t;$  |
| 6) $f(t) = t \cdot \operatorname{ch} 7t;$ | 7) $f(t) = t \cdot \cos 8t;$              | 8) $f(t) = t \cdot \sin 8t;$               | 9) $f(t) = t \cdot \operatorname{sh} 8t;$ | 10) $f(t) = t \cdot \operatorname{ch} 8t;$ |
| 11) $f(t) = t \cdot \cos 9t;$             | 12) $f(t) = t \cdot \sin 9t;$             | 13) $f(t) = t \cdot \operatorname{sh} 9t;$ |   |  |

## Практическое занятие 2.2

Найти оригиналы функций

(I) с помощью свойств преобразования Лапласа      (II) с помощью Maple

### Задание 1

- |   |  |   |   |
|---|--|---|---|
| 1) $F = \frac{32}{p+11} + \frac{23}{p-23}$  | 2) $F = \frac{35}{p+12} - \frac{25}{p+25}$ | 3) $F = \frac{4}{p+5} - \frac{5}{p+2}$      | 4) $F = \frac{5}{p-8} + \frac{8}{p+3}$      |
| 5) $F = \frac{6}{p+11} - \frac{11}{p+4}$    | 6) $F = \frac{7}{p-14} + \frac{14}{p+5}$   | 7) $F = \frac{8}{p+17} - \frac{17}{p+6}$    | 8) $F = \frac{9}{p-20} + \frac{20}{p+7}$    |
| 9) $F = \frac{10}{p+23} - \frac{23}{p+8}$   | 10) $F = \frac{11}{p-26} + \frac{26}{p+9}$ | 11) $F = \frac{12}{p+29} - \frac{29}{p+10}$ | 12) $F = \frac{13}{p-32} + \frac{32}{p+11}$ |
| 13) $F = \frac{14}{p+35} - \frac{35}{p+12}$ |  |   |   |

### Задание 2

- |  |   |  |  |
|--|---|--|--|
| 1) $F = \frac{12p}{p^2+121} - \frac{4}{p^2-36}$  | 2) $F = \frac{11p}{p^2+100} + \frac{2}{p^2-25}$ | 3) $F = \frac{4p}{p^2+1} - \frac{6}{p^2-4}$      | 4) $F = \frac{5p}{p^2+1} + \frac{7}{p^2-1}$      |
| 5) $F = \frac{9p}{p^2-4} - \frac{12}{p^2+4}$     | 6) $F = \frac{12p}{p^2+1} - \frac{16}{p^2-16}$  | 7) $F = \frac{13p}{p^2+9} + \frac{17}{p^2-9}$    | 8) $F = \frac{16p}{p^2-4} + \frac{21}{p^2+25}$   |
| 9) $F = \frac{17p}{p^2-16} - \frac{22}{p^2+16}$  | 10) $F = \frac{20p}{p^2+9} - \frac{26}{p^2-36}$ | 11) $F = \frac{21p}{p^2+25} + \frac{27}{p^2-25}$ | 12) $F = \frac{24p}{p^2-16} + \frac{31}{p^2+49}$ |
| 13) $F = \frac{25p}{p^2-36} - \frac{32}{p^2+36}$ |   |  |  |

## Задание 3

$$\begin{array}{llll}
 1) F = \frac{20}{p^2 - 18p + 97} & 2) F = \frac{21}{p^2 - 8p + 65} & 3) F = \frac{19}{p^2 + 6p + 58} & 4) F = \frac{21}{p^2 - 2p + 26} \\
 5) F = \frac{24}{p^2 + 4p + 20} & 6) F = \frac{22}{p^2 - 6p + 25} & 7) F = \frac{25}{p^2 + 8p + 25} & 8) F = \frac{23}{p^2 - 10p + 34} \\
 9) F = \frac{28}{p^2 - 4p + 104} & 10) F = \frac{26}{p^2 + 2p + 101} & 11) F = \frac{29}{p^2 - 2p + 82} & 12) F = \frac{34}{p^2 + 4p + 68} \\
 13) F = \frac{32}{p^2 - 6p + 73}
 \end{array}$$

## Задание 4

$$\begin{array}{lllll}
 1) F = \frac{-p - 85}{p^2 + 8p - 65} & 2) F = \frac{p + 96}{p^2 + 6p - 72} & 3) F = \frac{11p + 64}{p^2 + 10p - 56} & 4) F = \frac{13p - 43}{p^2 + 8p - 65} & 5) F = \frac{-p - 123}{p^2 + 12p - 45} \\
 6) F = \frac{p + 130}{p^2 + 10p - 56} & 7) F = \frac{13p + 1}{p^2 - p - 2} & 8) F = \frac{19p + 49}{p^2 - 5p + 4} & 9) F = \frac{-p - 28}{p^2 - p - 2} & 10) F = \frac{p + 34}{p^2 - 5p + 4} \\
 11) F = \frac{21p - 9}{p^2 - p - 2} & 12) F = \frac{23p + 59}{p^2 - 5p + 4} & 13) F = \frac{-p - 34}{p^2 - p - 2}
 \end{array}$$

## Задание 5

$$\begin{array}{llll}
 1) F = \frac{p + 29}{p^2 + 8p + 25} & 2) F = \frac{p + 18}{p^2 - 10p + 34} & 3) F = \frac{p + 26}{p^2 - 4p + 104} & 4) F = \frac{p + 27}{p^2 + 2p + 101} \\
 5) F = \frac{p + 28}{p^2 - 2p + 82} & 6) F = \frac{p + 36}{p^2 + 4p + 68} & 7) F = \frac{p + 29}{p^2 - 6p + 73} & 8) F = \frac{p + 41}{p^2 + 8p + 65} \\
 9) F = \frac{p + 30}{p^2 - 10p + 74} & 10) F = \frac{p + 46}{p^2 + 12p + 72} & 11) F = \frac{p + 31}{p^2 - 14p + 85} & 12) F = \frac{p + 51}{p^2 + 16p + 89} \\
 13) F = \frac{p + 32}{p^2 - 18p + 106}
 \end{array}$$

## Задание 6

$$\begin{array}{lllll}
 1) F = \frac{21 e^{(-21p)} p}{p^2 + 25} & 2) F = \frac{27 e^{(-20p)}}{p^2 - 25} & 3) F = \frac{24 e^{(-19p)} p}{p^2 - 16} & 4) F = \frac{31 e^{(-18p)}}{p^2 + 49} & 5) F = \frac{25 e^{(-17p)} p}{p^2 - 36} \\
 6) F = \frac{32 e^{(-16p)}}{p^2 + 36} & 7) F = \frac{28 e^{(-15p)} p}{p^2 + 25} & 8) F = \frac{36 e^{(-14p)}}{p^2 - 64} & 9) F = \frac{29 e^{(-13p)} p}{p^2 + 49} & 10) F = \frac{37 e^{(-12p)}}{p^2 - 49} \\
 11) F = \frac{32 e^{(-11p)} p}{p^2 - 36} & 12) F = \frac{41 e^{(-10p)}}{p^2 + 81} & 13) F = \frac{33 e^{(-9p)} p}{p^2 - 64}
 \end{array}$$

### Практическое занятие 2.3

Найти решение дифференциального уравнения  $y'' + a_1 y' + a_0 y = f(t)$   
удовлетворяющее начальным условиям  $y(0) = c_1, y'(0) = c_2$

(I) с помощью свойств преобразования Лапласа

(II) с помощью Maple

#### Задание 1

1)  $y'' - 9y' + 14y = 8e^{(4t)}$ ,  $c_1 = 2$ ,  $c_2 = 7$

2)  $y'' - 5y' - 14y = 8e^{(9t)}$ ,  $c_1 = -2$ ,  $c_2 = 7$

3)  $y'' - 10y' + 16y = 9e^{(5t)}$ ,  $c_1 = 2$ ,  $c_2 = 8$

4)  $y'' - 6y' - 16y = 9e^{(10t)}$ ,  $c_1 = -2$ ,  $c_2 = 8$

5)  $y'' - 7y' + 12y = 5e^{(6t)}$ ,  $c_1 = 3$ ,  $c_2 = 4$

6)  $y'' - y' - 12y = 5e^{(7t)}$ ,  $c_1 = -3$ ,  $c_2 = 4$

7)  $y'' - 8y' + 15y = 6e^t$ ,  $c_1 = 3$ ,  $c_2 = 5$

8)  $y'' - 2y' - 15y = 6e^{(8t)}$ ,  $c_1 = -3$ ,  $c_2 = 5$

9)  $y'' - 9y' + 18y = 7e^{(2t)}$ ,  $c_1 = 3$ ,  $c_2 = 6$

10)  $y'' - 10y' + 21y = 8e^{(5t)}$ ,  $c_1 = 3$ ,  $c_2 = 7$

11)  $y'' - 4y' - 21y = 8e^{(10t)}$ ,  $c_1 = -3$ ,  $c_2 = 7$

12)  $y'' - 11y' + 24y = 9e^{(4t)}$ ,  $c_1 = 3$ ,  $c_2 = 8$

13)  $y'' - 5y' - 24y = 9e^{(11t)}$ ,  $c_1 = -3$ ,  $c_2 = 8$