Задача 1

Исследовать сходимость числового ряда:

|  |  |
| --- | --- |
| **Вариант** |  |
|  | $$\sum\_{n=1}^{\infty }\frac{1+4n}{8^{n}}$$ |
|  | $$\sum\_{n=1}^{\infty }\frac{1}{\left(5n+3\right)^{n}}$$ |
|  | $$\sum\_{n=1}^{\infty }\frac{\left(1+n\right)!}{2^{n}}$$ |
|  | $$\sum\_{n=1}^{\infty }\frac{e^{-n}}{\sqrt{n+1}}$$ |
|  | $$\sum\_{n=1}^{\infty }\left(\frac{2n+1}{n}\right)^{n}$$ |
|  | $$\sum\_{n=1}^{\infty }5^{n}\left(1+\frac{1}{n}\right)^{n^{2}}$$ |
|  | $$\sum\_{n=1}^{\infty }\left(9n+1\right)4^{n}$$ |
|  | $$\sum\_{n=1}^{\infty }\frac{2^{n}n}{\left(n+1\right)!}$$ |
|  | $$\sum\_{n=1}^{\infty }\left(4+\frac{3}{n}\right)^{n}$$ |
|  | $$\sum\_{n=1}^{\infty }\frac{\sqrt{8n+1}}{3^{n}}$$ |

Задача 2

Исследовать сходимость числового ряда:

|  |  |
| --- | --- |
| **Вариант** |  |
|  | $$\sum\_{n=1}^{\infty }tg\frac{π}{3n}$$ |
|  | $$\sum\_{n=1}^{\infty }\frac{1}{1+\sqrt{n+2}}$$ |
|  | $$\sum\_{n=1}^{\infty }\frac{n+1}{n^{2}+3}$$ |
|  | $$\sum\_{n=1}^{\infty }\frac{2n}{5n+2}$$ |
|  | $$\sum\_{n=1}^{\infty }\sqrt{\frac{n+2}{n+1}}$$ |
|  | $$\sum\_{n=1}^{\infty }\frac{1}{n^{3}+3n}$$ |
|  | $$\sum\_{n=1}^{\infty }\frac{1}{4+\sqrt{n}}$$ |
|  | $$\sum\_{n=1}^{\infty }\frac{n^{2}}{n^{2}+2}$$ |
|  | $$\sum\_{n=1}^{\infty }\frac{1}{\left(n^{2}+n\right)^{2}}$$ |
|  | $$\sum\_{n=1}^{\infty }sin\frac{π}{n\sqrt{n}}$$ |

Задача 3

С помощью интегрального признака сходимости исследовать числовой ряд:

|  |  |
| --- | --- |
| **Вариант** |  |
|  | $$\sum\_{n=1}^{\infty }\frac{\left(-1\right)^{n+1}}{n^{2}+5}$$ |
|  | $$\sum\_{n=1}^{\infty }\frac{\left(-1\right)^{n+2}}{\sqrt{n^{2}+1}}$$ |
|  | $$\sum\_{n=1}^{\infty }\frac{\left(-1\right)^{n+1}}{1+\sqrt{n-1}}$$ |
|  | $$\sum\_{n=1}^{\infty }\frac{\left(-1\right)^{n-1}}{\left(n+2\right)^{n}}$$ |
|  | $$\sum\_{n=1}^{\infty }\frac{\left(-1\right)^{n}}{\sqrt{n+8}}$$ |
|  | $$\sum\_{n=1}^{\infty }\frac{\left(-1\right)^{n-1}}{\left(n-1\right)!}$$ |
|  | $$\sum\_{n=1}^{\infty }\frac{\left(-1\right)^{n+2}}{n^{2}+16}$$ |
|  | $$\sum\_{n=1}^{\infty }\frac{\left(-1\right)^{n+3}}{n\left(n+1\right)}$$ |
|  | $$\sum\_{n=1}^{\infty }\frac{\left(-1\right)^{n}}{2^{n}n!}$$ |
|  | $$\sum\_{n=1}^{\infty }\frac{\left(-1\right)^{n}}{\left(n+3\right)\sqrt{n+3}}$$ |

Задача 4

Найти три первых отличных от нуля члена разложения ряда $y=y\left(x\right)$ следующей задачи Коши:

|  |  |
| --- | --- |
| **Вариант** |  |
|  | $$y^{∕}=x^{2}+y^{2}+3x+2, y\left(0\right)=0.$$ |
|  | $$y^{∕}=x^{2}+9y+e^{y}+4, y\left(0\right)=0.$$ |
|  | $$y^{∕}=11+x^{2}+2y^{2}+4x, y\left(0\right)=0.$$ |
|  | $$y^{∕}=2e^{y}+x+3y, y\left(0\right)=0.$$ |
|  | $$y^{∕}=7cosx-3x+cosy+7, y\left(0\right)=0.$$ |
|  | $$y^{∕}=e^{x}+2xy+sinx+2, y\left(0\right)=0.$$ |
|  | $$y^{∕}=\frac{x^{2}}{2}+5siny+4, y\left(0\right)=0.$$ |
|  | $$y^{∕}=\frac{x^{3}}{3}+e^{2x}+6y, y\left(0\right)=0.$$ |
|  | $$y^{∕}=2sin2x+3e^{y}+1, y\left(0\right)=0.$$ |
|  | $$y^{∕}=sinx+3siny-6, y\left(0\right)=0.$$ |

Задача 5

Найти общее решение дифференциального уравнения:

|  |  |
| --- | --- |
| **Вариант** |  |
|  | $\left(x^{2}-y^{2}\right)y^{/}=2xy$*;*$$\left(1-x^{2}\right)y^{∕∕}=xy^{∕}$$ |
|  | $\left(1+x^{2}\right)y^{∕}-2xy=\left(1+x^{2}\right)^{2}$;$$2yy^{∕∕}+y^{2}+\left(y^{∕}\right)^{4}=0$$ |
|  | $xy^{∕}=yln\left(^{x}/\_{y}\right)$;$$y^{∕∕}+y^{∕}tgx=sin2x$$ |
|  | $xy^{∕}+y=3$;$$y^{∕∕}+\left(^{1}/\_{x}\right)y^{∕}=x^{2}$$ |
|  | $xy^{∕}+xe^{^{y}/\_{x}}-y=0$;$$1+\left(y^{∕}\right)^{2}+yy^{∕∕}=0$$ |
|  | $y^{∕}cosx=\left(y+1\right)sinx$;$$\left(1+y\right)y^{∕∕}-5\left(y^{∕}\right)^{2}=0$$ |
|  | $xy^{∕}-y=\sqrt{x^{2}+y^{2}}$;$$xy^{∕∕}+2y^{∕}=x^{3}$$ |
|  | $x^{2}y^{∕}-2xy=3$;$$y^{∕∕}tgy=2\left(y^{∕}\right)^{2}$$ |
|  | $x^{2}y^{∕}+y^{2}-2xy=0$;$$y^{∕∕}-2y^{∕}tgx=sinx$$ |
|  | $xy^{∕}+y=x+1$;$$3yy^{∕∕}+y^{2}=0$$ |

Задача 6

Найти частное решение дифференциального уравнения:

|  |  |
| --- | --- |
| **Вариант** |  |
|  | $$y^{∕∕}+4y^{∕}-12y=8sin2x, y\left(0\right)=0, y^{∕}\left(0\right)=0.$$ |
|  | $$y^{∕∕}-6y^{∕}+9y=x^{2}-x+3, y\left(0\right)=^{4}/\_{3}, y^{∕}\left(0\right)=^{1}/\_{27}.$$ |
|  | $$y^{∕∕}+4y=e^{-2x}, y\left(0\right)=0, y^{∕}\left(0\right)=0.$$ |
|  | $$y^{∕∕}-2y^{∕}+5y=xe^{2x}, y\left(0\right)=1, y^{∕}\left(0\right)=0.$$ |
|  | $$y^{∕∕}+5y^{∕}+6y=12cos2x, y\left(0\right)=1, y^{∕}\left(0\right)=3.$$ |
|  | $$y^{∕∕}-5y^{∕}+6y=\left(12x-7\right)e^{-x}, y\left(0\right)=0, y^{∕}\left(0\right)=0.$$ |
|  | $$y^{∕∕}-4y^{∕}+13y=26x+5, y\left(0\right)=1, y^{∕}\left(0\right)=0.$$ |
|  | $$y^{∕∕}-4y^{∕}=6x^{2}+1, y\left(0\right)=2, y^{∕}\left(0\right)=3.$$ |
|  | $$y^{∕∕}-2y^{∕}+y=16e^{x}, y\left(0\right)=1, y^{∕}\left(0\right)=2.$$ |
|  | $$y^{∕∕}+6y^{∕}+9y=10e^{-3x}, y\left(0\right)=3, y^{∕}\left(0\right)=2.$$ |

Задача 7

Вычислить значения степенной функции $f\left(z\right)$ в точке $z\_{0}$:

|  |  |
| --- | --- |
| **Вариант** |  |
|  | $$f\left(z\right)=z^{10}, z\_{0}=1+i\sqrt{3}$$ |
|  | $$f\left(z\right)=z^{7}, z\_{0}=\sqrt{2}+i\sqrt{2}$$ |
|  | $$f\left(z\right)=z^{4}, z\_{0}=\sqrt{7}+i\sqrt{7}$$ |
|  | $$f\left(z\right)=z^{6}, z\_{0}=3-i\sqrt{3}$$ |
|  | $$f\left(z\right)=z^{8}, z\_{0}=1-i$$ |
|  | $$f\left(z\right)=z^{6}, z\_{0}=6+i2\sqrt{3}$$ |
|  | $$f\left(z\right)=z^{5}, z\_{0}=2-2i$$ |
|  | $$f\left(z\right)=z^{5}, z\_{0}=2-i2\sqrt{3}$$ |
|  | $$f\left(z\right)=z^{6}, z\_{0}=\sqrt{3}+i$$ |
|  | $$f\left(z\right)=z^{9}, z\_{0}=1-i\sqrt{3}$$ |

Задача 8

Вычислить значение производной данной функции в точке $z=z\_{0}:$

|  |  |
| --- | --- |
| **Вариант** |  |
|  | $$w=shz, z\_{0}=2-i$$ |
|  | $$w=e^{5z}, z\_{0}=-1-i\sqrt{2}$$ |
|  | $$w=sin2z, z\_{0}=\frac{1}{2}i$$ |
|  | $$w=cosz, z\_{0}=i$$ |
|  | $$w=shz, z\_{0}=1+\frac{π}{4}i$$ |
|  | $$w=chz, z\_{0}=1-\frac{π}{2}i$$ |
|  | $$w=chz-2z, z\_{0}=1+i$$ |
|  | $$w=cos3z, z\_{0}=\frac{1}{3}i$$ |
|  | $$w=sin7z, z\_{0}=\frac{1}{7}-i$$ |
|  | $$w=e^{4z}, z\_{0}=-7-19i$$ |

Задача 9

Найти круг сходимости степенного ряда (z-комплексная переменная) и иобразить его на комплексной плоскости:

|  |  |
| --- | --- |
| **Вариант** |  |
|  | $$\sum\_{n=1}^{\infty }\frac{z^{n}}{5n}$$ |
|  | $$\sum\_{n=1}^{\infty }\frac{2^{n}z^{n}}{n}$$ |
|  | $$\sum\_{n=1}^{\infty }\frac{nz^{n}}{n+1}$$ |
|  | $$\sum\_{n=1}^{\infty }n^{2}z^{n}$$ |
|  | $$\sum\_{n=1}^{\infty }\frac{z^{n}}{n\sqrt{n}}$$ |
|  | $$\sum\_{n=1}^{\infty }4^{n}nz^{n}$$ |
|  | $$\sum\_{n=1}^{\infty }\frac{z^{n}}{\left(n+1\right)\left(n+2\right)}$$ |
|  | $$\sum\_{n=1}^{\infty }\frac{2^{n}z^{n}}{n7^{n+1}}$$ |
|  | $$\sum\_{n=1}^{\infty }\frac{z^{n}}{4^{2n-1}}$$ |
|  | $$\sum\_{n=1}^{\infty }\frac{3^{n-1}z^{n}}{\left(n+1\right)^{2}}$$ |

Задача 10

Представить функцию в виде суммы ряда по степеням z (ряд Маклорена):

|  |  |
| --- | --- |
| **Вариант** |  |
|  | $$f\left(z\right)=\frac{z^{3}}{1+2z}$$ |
|  | $$f\left(z\right)=z^{2}shz$$ |
|  | $$f\left(z\right)=ze^{2z}$$ |
|  | $$f\left(z\right)=\frac{z^{2}}{1+z}$$ |
|  | $$f\left(z\right)=zsinz$$ |
|  | $$f\left(z\right)=\frac{z}{1-2z}$$ |
|  | $$f\left(z\right)=z^{4}e^{-z}$$ |
|  | $$f\left(z\right)=z^{3}ch2z$$ |
|  | $$f\left(z\right)=z^{2}e^{z}$$ |
|  | $$f\left(z\right)=\frac{z^{7}}{1-4z}$$ |

Задача 11

Разложить данную функцию в ряд по степеням z (ряд Лорана) и определить порядок полюса z=0:

|  |  |
| --- | --- |
| **Вариант** |  |
|  | $$f\left(z\right)=\frac{1}{2z}e^{-z}$$ |
|  | $$f\left(z\right)=\frac{cosz}{z^{3}}$$ |
|  | $$f\left(z\right)=\frac{1}{z\left(1-2z\right)}$$ |
|  | $$f\left(z\right)=\frac{sin2z}{z^{4}}$$ |
|  | $$f\left(z\right)=\frac{1}{z^{3}}\frac{1}{\left(1+z\right)}$$ |
|  | $$f\left(z\right)=\frac{cos2z}{z^{2}}$$ |
|  | $$f\left(z\right)=\frac{sinz}{z^{3}}$$ |
|  | $$f\left(z\right)=\frac{e^{3z}}{z^{3}}$$ |
|  | $$f\left(z\right)=\frac{cos5z}{z}$$ |
|  | $$f\left(z\right)=\frac{sin5z}{z^{2}}$$ |