Math 2C03 2021 Practice problem set #8 (18615697)

Question 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Description
series and ordinary points

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1. Question Details ZillDiffEQ9 6.1.001.EP. [4603969]

Consider the following power series.

$$\sum_{n=1}^{\infty} \frac{(-1)^n}{n} x^n$$

Let $a_n = \frac{(-1)^n}{n} x^n$. Find the following limit.

$\lim_{n \to \infty} \left| \frac{a_{n+1}}{a_n} \right| =$ [ ]

Find the interval I and radius of convergence R for the given power series. (Enter your answer for interval of convergence using interval notation.)

$I =$ [ ]

$R =$ [ ]

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2. Question Details ZillDiffEQ9 6.1.003. [3748874]

Find the interval I and radius of convergence R for the given power series. (Enter your answer for interval of convergence using interval notation.)

$$\sum_{n=1}^{\infty} \frac{4^n}{n} x^n$$

$I =$ [ ]

$R =$ [ ]

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3. Question Details ZillDiffEQ9 6.1.005. [4568029]

Find the interval I and radius of convergence R for the given power series. (Enter your answer for interval of convergence using interval notation.)

$$\sum_{k=1}^{\infty} \frac{(-1)^k}{7^k}(x-6)^k$$

$I =$ [ ]

$R =$ [ ]

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4. Question Details ZillDiffEQ9 6.1.011. [3755992]

Use an appropriate series in (2) in Section 6.1 to find the Maclaurin series of the given function. Write your answer in summation notation.

$$e^{-x/7}$$

$$\sum_{n=0}^{\infty} \left(\quad \right)$$

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5. Question Details ZillDiffEQ9 6.1.013. [3756010]

Use an appropriate series in (2) in Section 6.1 to find the Maclaurin series of the given function. Write your answer in summation notation.

$$\frac{1}{5+x}$$

$$\sum_{n=0}^{\infty} \left(\quad \right)$$

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6. Question Details ZillDiffEQ9 6.1.015. [3756067]

Use an appropriate series in (2) in Section 6.1 to find the Maclaurin series of the given function. Write your answer in summation notation.

$$\ln(1-x)$$

$$\sum_{n=1}^{\infty} \left(\quad \right)$$

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7. Question Details ZillDiffEQ9 6.1.017. [4568250]

Use an appropriate series in (2) in Section 6.1 to find the Taylor series of the given function centered at the indicated value of a. Write your answer in summation notation.

$\cos(x)$, $a = 2\pi$ [*Hint:* Use periodicity.]

$$\sum_{n=0}^{\infty} \left(\quad \right)$$

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8. Question Details ZillDiffEQ9 6.1.023. [3748780]

Use a substitution to shift the summation index so that the general term of the given power series involves x^k.

$$\sum_{n=1}^{\infty} nc_n x^{n+3}$$

$$\sum_{k=4}^{\infty} \left(\quad \right)$$

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9. Question Details ZillDiffEQ9 6.1.025. [4903785]

Proceed as in this example to rewrite the given expression using a single power series whose general term involves x^k.

$$\sum_{n=1}^{\infty} nc_n x^{n-1} - \sum_{n=0}^{\infty} 5c_n x^n$$

$$\sum_{k=0}^{\infty} \left(\quad \right)$$

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10. Question Details ZillDiffEQ9 6.1.027.MI. [3748824]

Proceed as in Example 3 in Section 6.1 to rewrite the given expression using a single power series whose general term involves x^k.

$$\sum_{n=1}^{\infty} 8nc_n x^{n-1} + \sum_{n=0}^{\infty} 6c_n x^{n+1}$$

$$\quad + \sum_{k=1}^{\infty} \left(\quad \right)$$

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11. Question Details ZillDiffEQ9 6.1.029. [3748791]

Proceed as in Example 3 in Section 6.1 to rewrite the given expression using a single power series whose general term involves x^k.

$$\sum_{n=2}^{\infty} n(n-1)c_n x^{n-2} - 9\sum_{n=1}^{\infty} nc_n x^n + \sum_{n=0}^{\infty} c_n x^n$$

$$\square + \sum_{k=1}^{\infty} \left(\square \right)$$

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12. Question Details ZillDiffEQ9 6.R.005. [3744991]

Suppose the powers series $\sum_{k=0}^{\infty} c_k(x-5)^k$ is known to converge at 0 and diverge at 15. Discuss whether the series converges at -10, 3, 7, 10, 13. Possible answers are *does*, *does not*, or *might*.

At -10 the series ---Select--- converge.
At 3 the series ---Select--- converge.
At 7 the series ---Select--- converge.
At 10 the series ---Select--- converge.
At 13 the series ---Select--- converge.

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13. Question Details ZillDiffEQ9 6.2.001. [3744644]

Without actually solving the given differential equation, find the minimum radius of convergence R of power series solutions about the ordinary point $x = 0$. About the ordinary point $x = 1$.

$$(x^2 - 49)y'' + 2xy' + y = 0$$

$R =$ $\square$ $(x = 0)$

$R =$ $\square$ $(x = 1)$

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14. Question Details ZillDiffEQ9 6.2.007.EP. [4603928]

Consider the following differential equation to be solved using a power series.

$$y'' + xy = 0$$

Using the substitution $y = \sum_{n=0}^{\infty} c_n x^n$, find an expression for c_{k+2} in terms of c_{k-1} for $k = 1, 2, 3 \ldots$.

$c_{k+2} =$ [ ]

Find two power series solutions of the given differential equation about the ordinary point $x = 0$.

- $y_1 = 1 + x^2 + \frac{x^3}{6} + \ldots$ and $y_2 = x + x^2 + \frac{x^4}{12} + \ldots$
- $y_1 = 1 - \frac{x^2}{2} + \frac{x^4}{24} - \ldots$ and $y_2 = x - \frac{x^3}{6} + \frac{x^5}{120} - \ldots$
- $y_1 = 1 + \frac{x^3}{6} + \frac{x^6}{180} - \ldots$ and $y_2 = x + \frac{x^4}{12} + \frac{x^7}{504} - \ldots$
- $y_1 = 1 + \frac{x^2}{2} + \frac{x^4}{24} + \ldots$ and $y_2 = x + \frac{x^3}{6} + \frac{x^5}{120} + \ldots$
- $y_1 = 1 - \frac{x^3}{6} + \frac{x^6}{180} - \ldots$ and $y_2 = x - \frac{x^4}{12} + \frac{x^7}{504} - \ldots$

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15. Question Details ZillDiffEQ9 6.2.011. [3744817]

Find two power series solutions of the given differential equation about the ordinary point $x = 0$.

$$y'' + x^2y' + xy = 0$$

- $y_1 = 1 - \frac{1}{6}x^3 + \frac{1}{45}x^6 - \ldots$ and $y_2 = x - \frac{1}{6}x^4 + \frac{5}{252}x^7 - \ldots$
- $y_1 = 1 - \frac{1}{12}x^3 + \frac{5}{672}x^6 - \ldots$ and $y_2 = x - \frac{1}{3}x^4 + \frac{1}{15}x^7 - \ldots$
- $y_1 = 1 - \frac{1}{12}x^4 + \frac{5}{672}x^8 - \ldots$ and $y_2 = x - \frac{1}{10}x^5 + \frac{1}{120}x^9 - \ldots$
- $y_1 = 1 - \frac{1}{2}x^2 + \frac{1}{8}x^4 - \ldots$ and $y_2 = x - \frac{1}{10}x^5 + \frac{1}{120}x^9 - \ldots$
- $y_1 = 1 - \frac{1}{2}x^2 + \frac{1}{8}x^4 - \ldots$ and $y_2 = x - \frac{1}{3}x^3 + \frac{1}{15}x^5 - \ldots$

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16. Question Details ZillDiffEQ9 6.2.015. [3744795]

Find two power series solutions of the given differential equation about the ordinary point $x = 0$.

$y'' - (x + 1)y' - y = 0$

- $y_1 = 1 + \frac{x^2}{2} + \frac{x^3}{6} + \frac{x^4}{6} + \cdots$ and $y_2 = x + \frac{x^2}{2} - \frac{x^3}{6} - \frac{x^4}{6} + \cdots$
- $y_1 = 1 + \frac{x^4}{2} + \frac{x^6}{6} + \frac{x^8}{6} + \cdots$ and $y_2 = x + \frac{x^3}{2} + \frac{x^5}{2} + \frac{x^7}{4} + \cdots$
- $y_1 = 1 - \frac{x^2}{2} - \frac{x^3}{6} + \frac{x^4}{12} + \cdots$ and $y_2 = x + \frac{x^2}{2} - \frac{x^3}{6} - \frac{x^4}{6} + \cdots$
- $y_1 = 1 + \frac{x^2}{2} + \frac{x^3}{6} + \frac{x^4}{6} + \cdots$ and $y_2 = x + \frac{x^2}{2} + \frac{x^3}{2} + \frac{x^4}{4} + \cdots$
- $y_1 = 1 - \frac{x^2}{2} - \frac{x^3}{6} + \frac{x^4}{12} + \cdots$ and $y_2 = x + \frac{x^2}{2} + \frac{x^3}{2} + \frac{x^4}{4} + \cdots$

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17. Question Details ZillDiffEQ9 6.2.017. [4568204]

Find two power series solutions of the given differential equation about the ordinary point $x = 0$.

$(x^2 + 2)y'' + 6xy' - y = 0$

- $y_1 = 1 - \frac{x^2}{4} - \frac{13x^4}{96} - \cdots$ and $y_2 = x + \frac{5x^3}{12} + \frac{23x^5}{96} + \cdots$
- $y_1 = 1 - \frac{x^2}{4} - \frac{13x^4}{96} - \cdots$ and $y_2 = x - \frac{5x^3}{12} + \frac{23x^5}{96} - \cdots$
- $y_1 = 1 + \frac{x^2}{4} - \frac{13x^4}{96} + \cdots$ and $y_2 = x + \frac{5x^3}{12} + \frac{23x^5}{96} + \cdots$
- $y_1 = 1 + \frac{x^4}{4} - \frac{13x^8}{96} + \cdots$ and $y_2 = x - \frac{5x^5}{12} + \frac{23x^9}{96} - \cdots$
- $y_1 = 1 + \frac{x^2}{4} - \frac{13x^4}{96} + \cdots$ and $y_2 = x - \frac{5x^3}{12} + \frac{23x^5}{96} - \cdots$

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18. Question Details ZillDiffEQ9 6.2.019. [3744836]

Use the power series method to solve the given initial-value problem. (Format your final answer as an elementary function.)

$(x - 1)y'' - xy' + y = 0, y(0) = -5, y'(0) = 4$

$y =$

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19. Question Details ZillDiffEQ9 6.2.021. [3744636]

Use the power series method to solve the given initial-value problem. (Format your final answer as an elementary function.)

$y'' - 2xy' + 8y = 0, y(0) = 9, y'(0) = 0$

$y =$

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20. Question Details ZillDiffEQ9 6.2.025. [3745109]

Without actually solving the differential equation $(\cos x)y'' + y' + 7y = 0$, find the minimum radius of convergence of power series solutions about the ordinary point $x = 0$.

Find the minimum radius of convergence of power series solutions about the ordinary point $x = 1$.

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Assignment Details

Name (AID): **Math 2C03 2021 Practice problem set #8 (18615697)**
Submissions Allowed: **20**
Category: **Homework**
Code:
Locked: **Yes**
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