Calculus 2 Workbook

Power series

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POWER SERIES REPRESENTATION

■ 1. Find the power series representation of the function.

$$f(x) = \frac{3x}{7 + x^2}$$

■ 2. Find the power series representation of the function.

$$f(x) = \frac{5}{4 - 6x}$$

■ 3. Find the power series representation of the function.

$$f(x) = \frac{4}{x^2 - x^3}$$

■ 4. Find the power series representation of the function.

$$f(x) = \frac{5x^2}{1 + x^3}$$

■ 5. Find the power series representation of the function.

$$f(x) = \frac{x}{8 - x}$$

POWER SERIES MULTIPLICATION

■ 1. Use power series multiplication to find the first four non-zero terms of the Maclaurin series.

$$y = \cos(3x)e^{3x}$$

■ 2. Use power series multiplication to find the first four non-zero terms of the Maclaurin series.

$$y = \arctan(2x)\sin x$$

■ 3. Use power series multiplication to find the first four non-zero terms of the Maclaurin series.

$$y = e^{-2x}\cos(2x)$$

■ 4. Use power series multiplication to find the first four non-zero terms of the Maclaurin series.

$$y = e^{5x}\ln(1 + 3x)$$

5. Use power series multiplication to find the first four non-zero terms of the Maclaurin series.

$$y = e^{3x} \cdot \frac{3}{1-x}$$

POWER SERIES DIVISION

1. Use power series division to find the first four non-zero terms of the Maclaurin series.

$$y = \frac{e^{3x}}{x^2}$$

2. Use power series division to find the first four non-zero terms of the Maclaurin series.

$$y = \frac{6x}{\ln(1+6x)}$$

3. Use power series division to find the first four non-zero terms of the Maclaurin series.

$$y = \frac{\cos(2x)}{2x^3}$$

4. Use power series division to find the first four non-zero terms of the Maclaurin series.

$$y = \frac{\sin(3x)}{3x^2}$$

■ 5. Use power series division to find the first four non-zero terms of the Maclaurin series.

$$y = \frac{\arctan(4x)}{4x^2}$$

POWER SERIES DIFFERENTIATION

1. Differentiate to find the power series representation of the function.

$$f(x) = \frac{5}{(3 - x)^2}$$

2. Differentiate to find the power series representation of the function.

$$f(x) = \frac{3}{(4 + x)^2}$$

3. Differentiate to find the power series representation of the function.

$$f(x) = \frac{1}{(-5 - x)^2}$$

4. Differentiate to find the power series representation of the function.

$$f(x) = \frac{3}{(6 - 3x)^2}$$

5. Differentiate to find the power series representation of the function.

$$f(x) = \frac{2}{(1-2x)^2}$$

RADIUS OF CONVERGENCE

1. Find the radius of convergence of the series.

$$\sum_{n=0}^{\infty} \frac{(-1)^n x^{2n}}{4 \cdot 2^{2n}}$$

2. Find the radius of convergence of the series.

$$\sum_{n=0}^{\infty} \frac{(-1)^n x^{2n+1}}{(2n+1)!}$$

3. Find the radius of convergence of the series.

$$\sum_{n=0}^{\infty} \frac{x^n}{n+4}$$

4. Find the radius of convergence of the series.

$$\sum_{n=0}^{\infty} \frac{3^n (x+2)^n}{n!}$$

5. Find the radius of convergence of the series.

$$\sum_{n=0}^{\infty} \frac{3^n(x+2)^n}{n+1}$$

INTERVAL OF CONVERGENCE

1. Find the interval of convergence of the series.

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

2. Find the interval of convergence of the series.

$$\sum_{n=0}^{\infty}\frac{(-1)^n (x-3)^n}{n+1}$$

ESTIMATING DEFINITE INTEGRALS

1. Evaluate the definite integral as a power series, using the first four terms.

$$\int_0^2 \frac{24}{x^2+4}\ dx$$

2. Evaluate the definite integral as a power series, using the first four terms.

$$\int_0^1 3x\cos(x^3)\ dx$$

3. Evaluate the definite integral as a power series, using the first four terms.

$$\int_0^1 4e^{x^2}\ dx$$

ESTIMATING INDEFINITE INTEGRALS

1. Evaluate the indefinite integral as a power series.

$$\int x^2 \sin(x^2)\ dx$$

2. Evaluate the indefinite integral as a power series.

$$\int \ln(1+2x)\ dx$$

3. Evaluate the indefinite integral as a power series.

$$\int x^2 \cos(x^3)\ dx$$

BINOMIAL SERIES

1. Use a binomial series to expand the function as a power series.

$$f(x) = (3 + x)^5$$

2. Use a binomial series to expand the function as a power series.

$$f(x) = (6 - x)^4$$

3. Use a binomial series to expand the function as a power series.

$$f(x) = (-4 + x)^5$$

4. Use a binomial series to expand the function as a power series.

$$f(x) = (7 - x)^6$$

5. Use a binomial series to expand the function as a power series.

$$f(x) = (8 + x)^7$$

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