

More Chapter 7:

5. More improper integrals

a. $\int \frac{1}{x^2\sqrt{4+x^2}} dx$ b. $\int \frac{1}{x^2\sqrt{9-4x^2}} dx$ c. $\int \frac{x^3}{\sqrt{x^2+25}} dx$ d. $\int \frac{\sqrt{16x^2-1}}{x} dx$
e. $\int \frac{1}{3+x^2} dx$ f. $\int \frac{4x^2+3x-1}{2x^2-x-6} dx$ g. $\int \frac{2x^2+3x-8}{(x-4)(x+2)^2} dx$ h. $\int \frac{4x^2+5x}{(x-1)(x^2+2)} dx$

6. Some proper integrals:

a. $\int_0^{\pi/3} \sin^2 3x dx$ b. $\int_2^4 \frac{\sqrt{x^2-4}}{x^4} dx$ c. $\int_0^3 2^x dx$ d. $\int_0^{\pi/2} \sin^3 x \cos^2 x dx$

Chapter 11

7. Know the geometric series formula, and use it to find other power series.

a. $f(x) = \frac{3}{2+5x}$ b. $f(x) = \frac{1}{2+x}$ c. $f(x) = \frac{1}{(2+x)^2}$ d. $f(x) = \ln(2+x)$

(note: you will need to take a derivative (c) or an integral (d) for some of these problems.)

8. Use the first 5 non-zero terms of the given power series to estimate each of these function values:

a. Estimate $\ln(1.5)$ using $\ln(1+x) = \sum_{n=1}^{\infty} (-1)^{n-1} \frac{x^n}{n}$. b. Estimate e^3 using $e^x = \sum_{n=0}^{\infty} \frac{x^n}{n!}$.

9. Integrate using a power series expansion. Find an infinite power series for each indefinite integral:

a. Find $\int \sin(x^2) dx$ given $\sin(x) = \sum_{n=0}^{\infty} (-1)^n \frac{x^{2n+1}}{(2n+1)!}$ b. Find $\int \cos \sqrt{x} dx$ given $\cos(x) = \sum_{n=0}^{\infty} (-1)^n \frac{x^{2n}}{(2n)!}$

10. Use the first 4 non-zero terms to estimate each definite integral:

a. Estimate $\int_0^1 \sin(x^2) dx$ given $\sin(x) = \sum_{n=0}^{\infty} (-1)^n \frac{x^{2n+1}}{(2n+1)!}$ b. Estimate $\int_0^5 \ln(1+x^3) dx$ given $\ln(1+x) = \sum_{n=1}^{\infty} (-1)^{n-1} \frac{x^n}{n}$

11. Find the interval of convergence for each power series:

a. $\sum_{n=0}^{\infty} \frac{(-1)^n x^{2n}}{n^2 4^n}$ b. $\sum_{n=0}^{\infty} \frac{(x-2)^n}{n 4^n}$ c. $\sum_{n=0}^{\infty} \frac{x^{2n}}{9^n n!}$ d. $\sum_{n=0}^{\infty} \frac{(x+1)^{2n}}{9^n}$

12. Prove that a series converges or diverges using the integral test, ratio test, a comparison test, or the alternating series test.

a. $\sum_{n=0}^{\infty} \frac{(-1)^n}{3n+1}$ b. $\sum_{n=1}^{\infty} \frac{n}{4^n}$ c. $\sum_{n=1}^{\infty} \frac{1}{n^2}$ by the integral test d. $\sum_{n=1}^{\infty} \frac{2n+5}{n^2+3}$

Chapter 10

13. Graph a parametric or polar equation:

a. $x = t^2 + \pi t$ $-2\pi < t < \pi$ $y = 2 \cos t$ b. $x = t^2 + t$ $y = t^3 - 6t$ c. $r = \sin(4\theta)$ d. $r = 2 \sin \theta + 1$

14. Find the tangent line to a parametrically defined graph at the given point or value of t :

Do for 13a at $t = \pi/2$. Do for 13b at (0,5)

15. Find the points where the tangent line to a parametrically defined graph is horizontal or vertical (do for 13a, b)

16. Find the second derivative of a parametrically defined graph (do for 13 a and b)

17. Find the area enclosed by a polar graph.

a. Find the area enclosed by a loop of 13c. b. Find the area enclosed by the larger loop of 13d