Math 182 - Study Guide For The Final Exam

These are just some examples to review for your first exam, to fully prepare yourself for the exam you should know the materials from all of the sections that we have covered as well as the concept of examples we did in the class along mastering all your homework assignments.

1. Find the Maclaurin series for $f(x) = x\cos(4x)$

2. Find a power series representation for $f(t) = \ln(16 - t)$

3. Find the radius of convergence and the interval of convergence of the power series

   $$\sum_{n=0}^{\infty} \frac{(7x)^n}{n!}$$

4. Find the radius of convergence and the interval of convergence of the power series

   $$\sum_{n=0}^{\infty} \frac{x^n}{n+7}$$

5. Test the series for convergence or divergence

   $$\sum_{m=1}^{\infty} \frac{(-6)^{m+1}}{4^{5m}}$$

6. Determine whether the series converges or diverges

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

7. Determine whether the geometric series converges or diverges. If it converges, find its sum.

   $$\sum_{n=0}^{\infty} 8^n 9^{-n+1}$$

8. Determine whether the geometric series converges or diverges. If it converges, find its sum.

   $$\sum_{n=0}^{\infty} 4^n 5^{-n+1}$$

9. Find a formula for the general term a_n of the sequence, assuming that the pattern of the first few terms continues.

   $$\left\{-3, 2, -\frac{4}{3}, \frac{8}{9}, -\frac{16}{27}, \dots\right\}$$

10. Determine whether the sequence defined by $a_n = \frac{n^2-5}{6n^2+1}$ converges or diverges. If it converges find its limit.

11. Determine whether the improper integral converges or diverges, and if it converges, find its value.
$$\int_6^{\infty} \frac{1}{x^3}\,dx$$

12. Determine whether the improper integral converges or diverges, and if it converges, find its value.
$$\int_{-1}^{8} \frac{1}{\sqrt[3]{x}}\,dx$$

13. Find the volume of the solid formed by revolving the region bounded by the graph of $y = \sqrt{x}$, $y = x^2$ about the *x*-axis.

14. Find the area of the region bounded by the graph of the following curves:
$$y = x^2 + 2,\ y = -x,\ x = 0,\ x = 1.$$

15. Evaluate the indefinite integral $\int \cos^7 x \sin x\,dx$

16. Evaluate the indefinite integral $\int 7\,e^{\cos x} \sin x\,dx$

17. Newton's Law of Gravitation states that two bodies with masses m_1 and m_2 attract each other with force $F = G\frac{m_1 m_2}{r^2}$, where r is the distance between the bodies and G is the gravitational constant. If one of the bodies is fixed, find the work needed to move the other from $r = a$ to $r = b$.

18. A circular swimming pool has a diameter of 24 ft, the sides are 5 ft high, and the depth of the water is 4 ft. How much work is required to pump all of the water out over the side? (Use the fact that water weighs 62.5 lb/ft^3)

19. Find the integral $\int_0^1 \frac{x-4}{x^2-5x+6}\,dx$

20. Find the integral $\int \frac{5x^2-9x+6}{x^3-2x^2+x}\,dx$

21. Find the integral $\int \frac{1}{x(x-7)}\,dx$

22. Find the integral using an appropriate trigonometric substitution $\int x\sqrt{36-x^2}\,dx$

23. Find the integral using an appropriate trigonometric $\int \frac{x}{\sqrt{1-x^2}}\,dx$

24. Find the integral $\int \sin^3 x \cos^6 x\,dx$

25. Evaluate the integral $\int_0^2 (x^2+2)e^{-x}dx$

26. Evaluate the indefinite integral $\int x \cos 9x \, dx$

27. Evaluate the integral $\int_1^2 (\ln x)^2 dx$

28. Evaluate the integral $\int_0^1 x \cosh x \, dx$

29. Evaluate the integral $\int \frac{3x-2}{x+1} dx$

30. The masses m_i are located at the points P_i. Find the moments M_x and M_y and the center of mass of the system.

$m_1 = 6, m_2 = 3, m_3 = 2, m_4 = 9;$
$P_1(3,-2), P_2(0,0), P_3(-5,3), P_4(4,2).$

31. Find the centroid of the region bounded by the given curve $y = x^3, x + y = 2, x = 0$

32. Find the length of the curve $y = \ln(\sec x)\,, 0 \le x \le \frac{\pi}{4}$

33. Use the comparison test to determine whether the series is convergent or divergent

$$\sum_{n=3}^{\infty} \frac{7^n}{2^n - 3}$$

34. Determine whether the series is convergent or divergent.

$$\sum_{n=1}^{\infty} \frac{n^6 + 4}{n^8 + n}$$

35. Determine whether the series is convergent or divergent.

$$\sum_{n=0}^{\infty} \frac{2^n}{n!}$$

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Answer Section

1. ANS: $\sum_{n=0}^{\infty}(-1)^n \frac{4^{2n}x^{2n+1}}{(2n)!}$ Section 11.10
2. ANS: $\ln 16 - \sum_{n=1}^{\infty}\frac{t^n}{n16^n}$ Section 11.9
3. ANS: $R = \infty, \quad I = (-\infty, \infty)$ Section 11.8
4. ANS: $R = 1, \quad I = [-1,1)$ Section 11.8
5. ANS: Convergent Section 11.5
6. ANS: Converges Section 11.6
7. ANS: 81 Section 11.2
8. ANS: 25 Section 11.2
9. ANS: $a_n = -3\left(-\frac{2}{3}\right)^{n-1}$ Section 11.1
10. ANS: 1/6 Section 11.1

11. ANS: 1/72 Section 7.8
12. ANS: 9/2 Section 7.8
13. ANS: $3\pi/10$ Section 6.2
14. ANS: 17/6 Section 6.1

15. ANS: $-\frac{\cos^8 x}{8} + C$ Section 5.5
16. ANS: $-7e^{\cos x} + C$ Section 5.5
17. ANS: $Gm_1m_2\left(\frac{1}{a} - \frac{1}{b}\right)$ Section 6.4
18. ANS: 108,000π ft-lb Section 6.4
19. ANS: $\ln\frac{3}{8}$ Section 7.4
20. ANS: $\ln\left|\frac{x^6}{x-1}\right| - \frac{2}{x-1} + C$ Section 7.4
21. ANS: $\frac{1}{7}\ln\left|\frac{x-7}{x}\right| + C$ Section 7.4
22. ANS: $-\frac{1}{3}(36 - x^2)^{\frac{3}{2}} + C$ Section 7.3
23. ANS: $-\sqrt{1-x^2} + C$ Section 7.3
24. ANS: $\frac{1}{9}\cos^9 x - \frac{1}{7}\cos^7 x + C$ Section 7.2
25. ANS: $-12e^{-2} + 4$ Section 7.1

26.	ANS:	$\frac{1}{81}\cos 9x + \frac{x}{9}\sin 9x + C$	Section 7.1
27.	ANS:	$2(\ln 2)^2 - 4\ln 2 + 2$	Section 7.1
28.	ANS:	$\sinh 1 - \cosh 1 + 1$	Section 7.1
29.	ANS:	$3x - 5\ln\lvert x+1\rvert + C$	Section 7.4
30.	ANS:	$M_x = 12, M_y = 44, \left(\frac{11}{5}, \frac{3}{5}\right)$	Section 8.3
31.	ANS:	$\left(\frac{28}{75}, \frac{92}{105}\right)$	Section 8.3
32.	ANS:	$\ln\left(\sqrt{2}+1\right)$	Section 8.1
33.	ANS:	Divergent	Section 11.4
34.	ANS:	Convergent	Section 11.4
35.	ANS:	Convergent	Section 11.6