

Math 182 - Study Guide For The Exam #3 (Updated)

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 Taylor series for $f(x) = \ln(x)$ centered at $a = 2$ and its radius of convergence.
2. Find the Taylor series for $f(x) = e^{2x}$ centered at $a = 3$.
3. Find the sum of the series: $1 - \ln 2 + \frac{(\ln 2)^2}{2!} - \frac{(\ln 2)^3}{3!} + \dots$
4. Use Maclaurin series to evaluate the limit: $\lim_{x \rightarrow 0} \frac{\sin(x) - x + \frac{1}{6}x^3}{x^5}$
5. A 10 ft chain weighs 25 lb and hangs from a ceiling. Find the work done in lifting the lower end of the chain to the ceiling so that it's level with the upper end.
6. A spring has a natural length of 20 cm. If a 25 N force is required to keep it stretched to a length of 30 cm, how much work is required to stretch it from 20 cm to 25 cm?
7. An aquarium 2 m long, 1 m wide, and 1 m deep is full of water. Find the work needed to pump half of the water out of the aquarium. (Use the fact that the density of water is 1000 kg/m³)
8. Find the length of the curve $y = 1 + 6x^{3/2}$, $0 \leq x \leq 1$.
9. Find the length of the curve $y = 3 + \frac{1}{2} \cosh 2x$, $0 \leq x \leq 1$.
10. 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.
 $m_1 = 3, m_2 = 7, m_3 = 13;$
 $P_1(1,5), P_2(3, -2), P_3(-2, -1).$
11. Find the centroid of the region bounded by the given curve and the line $y = 4$ and $y = x^2$.
12. Find the coordinates of the centroid for the region bounded by the curve $y = \sqrt{x}$, $y = x$.
13. For what values of r does the function $y(x) = e^{rx}$ satisfy the differential equation $2y'' + y' - y = 0$?
14. Is $y = e^{-6t}$ a solution of the differential equation $y'' - y' - 42y = 0$?
15. For what values of ω does the function $y(x) = \cos(\omega x)$ satisfy the differential equation $4y'' = 25y$?

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Answer Section

1. ANS: $\ln 2 + \sum_{n=1}^{\infty} (-1)^{n+1} \frac{1}{n2^n} (x-2)^n, R = 2.$ Section 11.10
2. ANS: $\sum_{n=0}^{\infty} \frac{2^n e^6}{n!} (x-3)^n$ Section 11.10
3. ANS: $\frac{1}{2}$ Section 11.10
4. ANS: $\frac{1}{120}$ Section 11.10
5. ANS: 62.5 ft-lb Section 6.4
6. ANS: 0.31 J Section 6.4
7. ANS: 2450 J Section 6.4
8. ANS: $\frac{2}{243} (82\sqrt{82} - 1)$ Section 8.1
9. ANS: $\frac{1}{2} \sinh 2$ Section 8.1
10. ANS: $M_x = -12, M_y = -2,$
 $\left(-\frac{2}{23}, -\frac{12}{23}\right)$ Section 8.3
11. ANS: $\left(0, \frac{12}{5}\right)$ Section 8.3
12. ANS: $\left(\frac{2}{5}, \frac{1}{2}\right)$ Section 8.3
13. ANS: $\frac{1}{2}, -1$ Section 9.1
14. ANS: Yes Section 9.1
15. ANS: $\pm \frac{5}{2}$ Section 9.1