

# Math 102, Fall 2021 — Exam 3 notes

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Exam 3 on December 9-13

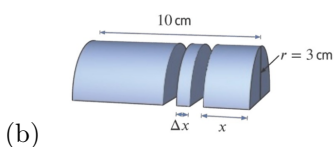
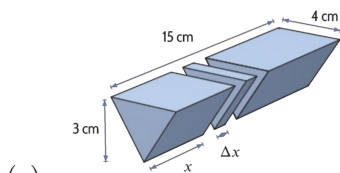
## Remarks

Your last exam will contain about 6 problems, some with multiple parts. It will be cumulative, but with much of the focus on material since the last exam, which includes sections 8.1, 8.2, 10.1, 10.2, 10.3. These topics are volumes by slicing, volumes of revolution using the disc, washer, and shell methods, Taylor polynomials, and Taylor series. The problems will all be similar to homework. While old worksheets, lecture problems, and homework problems all give lots of examples (try them without looking at solutions), there are also problems in our textbook, with answers to odd-numbered problems in the back. No notes will be allowed on the exam, but you can use a scientific calculator with no graphing functionality.

The sample problems below give you some practice of the main topics, but make sure to study old problems to get a complete overview.

## Sample problems

1. Find the volumes of each of the following solids using the method of slices.



- (c) A cone whose base is a circle of radius 3 cm and whose height is 10 cm.
  - (d) A pyramid whose base is a square with side length 4 cm and whose height is 7 cm.
2. Sketch the region bounded by the given curves and then find the volume obtained by rotating the region about the given axis. Do this in two ways: using the disc/washer method and using the shell method.
    - (a)  $y = x^2$ ,  $y = 9$ ,  $x = 0$ ; about the  $x$ -axis
    - (b)  $y = \sqrt{x}$ ,  $y = 0$ ,  $x = 1$ ; about  $x = -1$
    - (c)  $y = x^3$ ,  $y = 0$ ,  $x = 2$ ; about  $y = -2$
    - (d)  $y = \ln x$ ,  $y = 1$ ,  $y = 2$ ,  $x = 0$ ; about the  $y$ -axis
  3. Find the first 5 terms of the Taylor series centered at 0 for each of the following functions.

- (a)  $f(x) = \sin(x^4)$
- (b)  $f(x) = xe^{2x}$
- (c)  $f(x) = \ln(1 - x^3)$
- (d)  $f(x) = \frac{x}{1 + x^2}$
- (e)  $f(x) = \frac{x^3}{(1 + x)^2}$
- (f)  $f(x) = x^4 + 4x^3 + 5x^2 - 3x - 7$
- (g)  $f(x) = x^3 - 3x^2 + 5$

4. Find the sum of the series below.

- (a)  $1 - \ln 2 + \frac{(\ln 2)^2}{2!} - \frac{(\ln 2)^3}{3!} + \dots$
- (b)  $\sum_{n=0}^{\infty} (-1)^n \frac{\pi^{2n+1}}{4^{2n+1}(2n+1)!}$
- (c)  $\sum_{n=0}^{\infty} (-1)^n \frac{\pi^{2n}}{3^{2n}(2n)!}$