

Practice Problems by Topic

- Calculus with inverse trigonometric functions (e.g., Apex Calculus Volume 1 Section 2.7 Exercises 15-19, 21-29, Section 6.1 Exercises 41-50, 64-65, 81, 83; OpenStax Calculus Volume 1 Section 3.7 Exercises 279-288, 295-299, Section 5.7 Exercises 391-402, 411-416, 423-432)
- Calculus with hyperbolic functions (e.g., Apex Calculus 2 Section 6.6 Exercises 11-15, 22-24, 27-28, 32-35, 40-42; OpenStax Calculus Volume 2 Section 2.9 Exercises 385-404, 412-418, 425-426)
- Find the area between two curves. (e.g., Apex Calculus 2 Section 7.1 Exercises 4-26; OpenStax Calculus Volume 2 Section 2.1 Exercises 1-3, 5-48)
- Find the volume of a solid using integrals and cross sections. (e.g., Apex Calculus 2 Section 7.2 Exercises 18-21; OpenStax Calculus Volume 2 Section 2.2 Exercises 63-73)
- Find the volume of a solid of revolution using disks or washers—this is also just using cross sections, but it always gets separate treatment in textbooks. (e.g., Apex Calculus 2 Section 7.2 Exercises 4-17; OpenStax Calculus Volume 2 Section 2.2 Exercises 62, 74-107)
- Find the volume of a solid of revolution using shells. (e.g., Apex Calculus 2 Section 7.3 Exercises 1-18; OpenStax Calculus Volume 2 Section 2.3 Exercises 114)
- Find the length of an arc. (e.g., Apex Calculus 2 Section 7.4 Exercises 3-20; OpenStax Calculus Volume 2 Section 2.4 Exercises 165-167, 171-190)
- Find the surface area of a solid of revolution. (e.g., Apex Calculus 2 Section 7.4 Exercises 29-33; OpenStax Calculus Volume 2 Section 2.4 Exercises 191-209)
- Integration by Parts (e.g., Apex Calculus Section 6.2 Exercises 4-47; OpenStax Calculus Section 3.1 Exercises 6-68)
- Trigonometric Integrals (e.g., Apex Calculus Section 6.3 Exercises 4-33; OpenStax Calculus Section 3.2 Exercises 73-114, 118-120)
- Trigonometric Substitution (e.g., Apex Calculus Section 6.4 Exercises 5-32; OpenStax Calculus Section 3.3 Exercises 134-153, 160-164, 167-181)
- Partial Fractions (e.g., Apex Calculus Section 6.5 Exercises 7-29; OpenStax Calculus Section 3.4 Exercises 182-232)
- Approximate Integration (e.g., Apex Calculus Section 5.5 Exercises 4-25; OpenStax Calculus Section 3.6 Exercises 299-346)
- Use L'Hôpital's Rule (e.g., Apex Calculus Section 6.7 Exercises 52; OpenStax Calculus Volume 1 Section 4.8 Exercises 356-405)
- Improper Integrals, including using the Comparison Test (e.g., Apex Calculus Section 6.8 Exercises 7-43; OpenStax Calculus Section 3.7 Exercises 347-354, 372-400, possibly some in 355-371)
- Things with sequences: find the first several terms, determine if a sequence converges, find the limit of a convergent sequence, determine if a sequence is increasing/decreasing/neither, determine if a sequence is bounded, use the Monotone Convergence Theorem where appropriate, use the Squeeze Theorem where appropriate (e.g., Apex Calculus Section 8.1 Exercises 5-38; OpenStax Calculus Section 5.1 Exercises 1-4, 12-13, 23-37, 40-43, 46-53, 59-61)
- Use the sequence of partial sums for a series. (e.g., Apex Calculus Section 8.2 Exercises 6-13, 30-44; OpenStax Calculus Section 5.2 Exercises 79-82)

- Determine if a series converges (p -series, geometric series, telescoping series) and find its sum where possible. (e.g., Apex Calculus Section 8.2 Exercises 14–29; OpenStax Calculus Section 5.2 Exercises 83, 89–92, 101–108, Section 5.3 Exercises 165–168)
- Apply the series convergence tests as appropriate to determine if a series converges—Integral Test, Comparison Test, Limit Comparison Test, absolute convergence, Alternating Series Test, Ratio Test, Root Test. (e.g., Apex Calculus Section 8.3 Exercises 1–41, Section 8.4 Exercises 1–34, Section 8.5 Exercises 1–20; OpenStax Calculus Section 5.3 Exercises 138–164, Section 5.4 Exercises 194–228, Section 5.5 Exercises 250–267, 294–300, Section 5.6 Exercises 317–357, 364–367)
- Approximate an alternating series to within a given error and find the error bound of a given approximation of an alternating series. (e.g., Apex Calculus Section 8.5 Exercises 21–28; OpenStax Calculus Section 5.5 Exercises 280–285)
- Taylor Polynomials (e.g., Apex Calculus Section 8.7 Exercises 5–33; OpenStax Calculus Section 6.3 Exercises 116–131)
- Taylor Series (e.g., Apex Calculus Section 8.8 Exercises 1–20, 25–32; OpenStax Calculus Section 6.3 Exercises 132–135, 140–173)

Notes on the Practice Problems Above

- Many of the OpenStax exercises have a paragraph above the first one telling you more details about the problem, so if you're not sure what the question is asking, look above it to see if there's a paragraph starting with "In the following exercises...."
- Problems are in volume 2 of each textbook unless otherwise noted.

Notecards for Celebrations of Learning

You may bring with you for a celebration one 3 inch $\times$ 5 inch notecard on which you have handwritten whatever you will find helpful on one side; the other side must be blank. Things I would write on my notecard include hyperbolic function identities and facts that I can't remember (e.g., derivatives of inverse hyperbolic functions), and arc length and surface area formulas, trig identities that I can't remember, trig substitution formulas, formulas for numerical approximation that I can't remember, error bound formulas for numerical integration, and series tests that I can't remember.