Exam 3 Review

This is just a guide to help you study. I do not guarantee that anything will or will not be on the exam based on this guide.

Basics

Monday, November 22, 2021 in class. No books or notes or cell phones. You may use a scientific calculator. Sections covered 4.9, 5.1 - 5.3, 5.5, 7.1-7.4, 7.6.

Practice Problems

- pg. 281 **Concept Check**: 10
- pg. 282-284 **Exercises**: 53-60
- pg. 340 **Concept Check**: 1-3, 6-8
- pg. 341-343 **Exercises**: 1-5, 7-26, 29-30 (ignore graphing part), 33, 34, 49
- pg. 482 **Concept Check**: 1-3, 5a-g,
- pg. 483-485 **Exercises**: 1-4, 11-19, 21-36, 38-42, 44, 47, 48-52, 57-60(not graphing part), 92-100

Suggestions

- Work lots and lots of problems, especially those on material you don't understand as well. Try to solve problems without looking at the book for formulas or similar problems.
- When possible, ask yourself WHY you are solving a problem a certain way or WHY the result is true.
- Do not look at solutions unless you are desperate. It is much easier to read a correct solution than it is to figure it out yourself.
- Pay attention to details and check your work!!

Sample Problems

1. (a) Estimate the area under the graph of $f(x) = x^2 - x + 4$ on the interval $[1,4]$ using 6 approximating rectangles and right endpoints.

(b) Repeat part (a) using left endpoints.

2. (a) Express the limit as a definite integral

$$\lim_{n\to\infty} \sum_{i=1}^{n} \left(3\left(\frac{3i}{n}\right)^2 - 4 \right) \frac{3}{n}.$$

(b) Evaluate the integral by interpreting it in terms of area of a familiar shape.

$$\int_{-4}^{4} \sqrt{16 - x^2}\, dx$$

3. Use the definition of the integral (Theorem 4 in Section 5.2) to evaluate $\int_0^3 3 - x^2 dx$ It may help to remember that $\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}$.

4. Find the general antiderivatives of the following functions.

(a) $f(x) = x^3 - 2x$

(b) $f(x) = \sin x$

(c) $f(x) = \sqrt{x+4}$

5. Use logarithmic differentiation to find the derivative of $f(x) = (\sin x)^{\sqrt{x}}$.

6. Differentiate the following functions.

(a) $f(x) = \ln(x^2 - x)$

(b) $f(x) = \sin(\sqrt{e^{2x} + \ln x})$

(c) $f(x) = \sin^{-1} x$

(d) $f(x) = (\sqrt{1 - x^2}) \cdot (\sec^{-1} x)$

(e) $f(x) = \arccos(x + \tan^{-1} x)$

(f) $f(x) = \ln|\csc^{-1} x|$

7. Evaluate the integrals.

(a) $\int x^3 - 2x \ dx$

(b) $\int_0^{\pi} \sin x \ dx$

(c) $\int \frac{1}{x\sqrt{25x^2 - 1}} \ dx$

(d) $\int_{-1}^{1} \sqrt{x+4} \ dx$

(e) $\int \frac{1}{x(\ln x)^2} \ dx$

(f) $\int_{-1}^{3} e^{2x} \ dx$

(g) $\int_0^2 \sqrt[5]{x^4 - x^2}(10x^3 - 5x) \ dx$

(h) $\int \frac{x}{3x^2 - 5} \ dx$

8. Solve for x in each of the following equations.

(a) $\ln(x^2 + 1) - 3\ln(x) = \ln(2)$.

(b) $e^{2x+1} = 9e^{1-x}$

9. Find the equation of the tangent line to the graph $f(x) = 2e^{1-x^2}$ at the point (1,2).

10. Compute the derivative of the function. $f(x) = \int_1^x \cot t \ dt$.

12. Find the integral $\int_1^{\sqrt{3}} \frac{4}{1+x^2} \ dx$.