Lecture note 34 (Nov 29, 2017)

- Homework #7 due: Friday Dec 1, 2017
- Exam Review and its solution will be posted.
- Complete MAPS (Survey) → "Bonus Mark"
- Complete Course Evaluation

How to Study and where to get problems?

- Homeworks
- Labs
- Quizzes
- Practice Problem
- Last year's Exams (2015, 2016) ✓ "Do this for sure Very important"
- Exam Review
- Examples in Lecture notes

→ "online at Math 190 webpage"
Topics:

- Equation of line
- Trig functions (unit circle)
- Exponential function
- Logarithm function
- Composition of functions
- Properties of functions

No explicit exam questions

“Still need to be able to work with these”

- Limits
  - “Will enter into the definition of derivative and integral”

- Asymptote
  - “May have to draw or explain but not compute”

- Definition of Derivative
  - “State/Explain/Compute”

- Compute Derivative
  - “Power/Product/Quotient/Chain Rules”

- Riemann Sums
  - State/explain definition of integral
  - Approximate area with rectangles
    - Right/Left endpoints
• Definite / Indefinite Integrals
  - Simple integrals + (Fundamental Theorem)
  - Substitution Rule
  - Integration by Parts (IBP)

• Expect to draw a/some function(s)

• Find Equation of Tangent lines. (90%)

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Correction: Example 4 in lecture 33

\[ \frac{1}{2} \int u e^u \, du = \frac{1}{2} u e^u - \frac{1}{2} e^u + c \]

\[ \int x^3 e^{x^2} \, dx = \frac{1}{2} x^2 e^{x^2} - \frac{1}{2} e^{x^2} + c \]
Review Question 1: Approximate the following integral using Riemann Sums \( \int_{1}^{3} (-2x+7) \, dx \).

a) Use right endpoints and \( n = 4 \) (i.e., four rectangles)

\[
\begin{align*}
\Delta x &= \frac{b-a}{n} \\
\Delta x &= \frac{3-1}{4} = \frac{2}{4} = \frac{1}{2} = 0.5
\end{align*}
\]

Riemann Sums using right endpoints

\[
= 0.5f(1.5) + 0.5f(2) + 0.5f(2.5) + 0.5f(3)
\]

\[
= (0.5)(4) + (0.5)(3) + (0.5)(2) + (0.5)(1) = 5
\]

b) Is your approximation less than, greater than, or exactly equal to the value of the integral? Explain why!

Less. => Take a look at (\(*\)). We are missing some areas.
5. Review Question 2: Suppose that \( \int_{-1}^{1} f(x) \, dx = 3 \) and \( \int_{2}^{1} f(x) \, dx = 4 \).

a) Find \( \int_{-1}^{2} f(x) \, dx \).

\[
\int_{a}^{b} f(x) \, dx = -\int_{b}^{a} f(x) \, dx
\]

\[
\Rightarrow \int_{-1}^{2} f(x) \, dx = -\int_{2}^{1} f(x) \, dx = -4
\]

by part (a) given

\[
\Rightarrow \int_{1}^{2} f(x) \, dx = -4 - 3 = -7
\]

c) Find \( \int_{3}^{3} f(x) \, dx \).

The area under \( f(x) \) between 3 and 3

= nothing = 0

(****) \( \int_{a}^{b} f(x) \, dx = 0 \)
\[(5) \int_{a}^{b} f(x) dx = -\int_{b}^{a} f(x) dx.\]

\[(\star \star) \int_{a}^{c} f(x) dx = \int_{a}^{b} f(x) dx + \int_{b}^{c} f(x) dx.\]

\[(\star \star \star) \int_{a}^{a} f(x) dx = 0.\]
Review Question 3. Find all values of \( b \) such that
\[
\int_{0}^{b} (2x+3) \, dx = 4
\]

**Step 1:** Compute the integral

**Step 2:** Use fundamental Theorem \((a=0)\)

**Steps:** Set your answer equal to 4 and solve for \( b \) \( \Rightarrow \) Find \( b \)

So,
\[
\int_{0}^{b} (2x+3) \, dx = \left. x^2 + 3x \right|_{0}^{b}
\]

\( F(x) = \text{anti-derivative} \)

\[
= F(b) - F(0) = (b^2 + 3b) - (0^2 + 3(0)) = \frac{b^2}{2} + 3b.
\]

Then,
\[
b^2 + 3b = 4 \quad \Rightarrow \quad b^2 + 3b + 4 = 0
\]

\[
b = 1 \text{ and } b = -4
\]

Review Question 4: Graph a function that satisfies
\[
\int_{-2}^{2} f(x) \, dx = 0.
\]