

## MATH 202 Exam I (4.9 - 5.5) Review

1. Know how to find area of region using Riemann Sums.
2. Know the Fundamental Theorem of Calculus.
3. Know the properties of the definite integral.
4. Know the Midpoint rule.
5. Know the Comparison properties of the integral.
6. Know how to find the integral using substitution

Example exercises: Quiz & Homework questions; Ch.5 Review, #1-5, 9 - 38, 43 - 46, 51, 55, 60

### A Few Worked Examples

1. Find the area of the region between the graph of  $y = x^2 + 2$  and the x-axis over the interval  $[0,1]$ .

$$\begin{aligned} \text{Area} &= \lim_{n \rightarrow \infty} \sum_{i=1}^n f(c_i) \Delta x = \lim_{n \rightarrow \infty} \sum_{i=1}^n \left( \left( \frac{i}{n} \right)^2 + 2 \right) \left( \frac{1}{n} \right) = \lim_{n \rightarrow \infty} \frac{1}{n} \left( \frac{1}{n^2} \sum_{i=1}^n i^2 + \sum_{i=1}^n 2 \right) \\ &= \lim_{n \rightarrow \infty} \frac{1}{n} \left( \frac{1}{n^2} \left( \frac{n(n+1)(2n+1)}{6} \right) + 2n \right) = \lim_{n \rightarrow \infty} \left( \frac{n(n+1)(2n+1)}{6n^3} + 2 \right) \\ &= \lim_{n \rightarrow \infty} \left( \frac{2n^3 + 3n^2 + n}{6n^3} + 2 \right) = \frac{1}{3} + 2 = \frac{7}{3} \end{aligned}$$

2. Find  $F'(x)$  given  $F(x) = \int_{-2}^x (t^2 - 2t) dt$ .

$$F'(x) = x^2 - 2x$$

3. Find the indefinite integral of  $\int \frac{\sin x}{\cos^3 x} dx$ . Let  $u = \cos x$ ,  $du = -\sin x dx$ ,

$$-du = \sin x dx. \quad -\int \frac{1}{u^3} du = \frac{1}{2} u^{-2} + C = \frac{1}{2 \cos^2 x} + C$$