

# Review Page

## Anti-derivatives

- Find  $\int e^{5x} dx$ .  $\int \sin(2x) dx$ .

## Riemann Sums

- Write down a right/left endpoint Riemann Sum.  
Is it over or under-estimate?
- Look at a Riemann sum and identify the integral it approximates. (This is a Right R-sum).  
$$\sum_{i=1}^n \frac{3}{n} \left[ \left( 4 + \frac{3i}{n} \right)^2 + \left( 4 + \frac{3i}{n} \right) + 1 \right]$$

## Fundamental Theorem

- Be able to state and use the Fundamental Theorem.

$$\frac{d}{dx} \int_1^{x^3} e^t dt$$

## Average Value

- Know how to calculate the average value of a function over an interval. Understand what the average value looks like in a graph. (eg. rectangle).
- Know the Mean Value Theorem for Integrals.

## Integrals

- Comfort with integrating trig functions.
- U-substitution.
- Flipping bounds and pulling out constants.
- Be able to find bounds by comparing to a simple-to-integrate ftn eg.  $\int \frac{2x}{x^3+1} dx$  to  $\int \frac{2x}{x^3} dx = \int \frac{2}{x^2} dx$ .

Eg. Find a lower bound on the value of

$$\int_1^8 \sqrt{x^2 + 1} dx$$

by looking where

$$f(x) = \sqrt{x^2 + 1} \text{ is}$$

smallest on this interval.

### Series (Geometric)

- Know what a geometric series is.
- Write a series in summation notation ( $\Sigma$ )

$$1 + \left(\frac{4}{3}\right) + \left(\frac{16}{9}\right) + \left(\frac{64}{27}\right) + \dots$$

- Be able to calculate the value of a geometric series, if it exists.

### Other things

- Tell whether a function is even/odd (polynomials and sin/cos/tan).
- Be able to calculate integrals by taking areas of simple shapes including half-circles.
- Initial value problems (position/velocity/acceleration).

Ex. Let  $v(t)$  be the velocity of a car, <sup>(mph)</sup> what does

$$\int_1^3 v(t) dt \text{ represent?}$$

$$\int_1^3 |v(t)| dt ?$$