Lecture Handout #23: Nov 17

Estimating and Calculating Definite Integrals

Estimate $\int_1^4 \sqrt{t}\,dt$ using Riemann sums: $f(t) = \sqrt{t}$, $a = 1$, $b = 4$

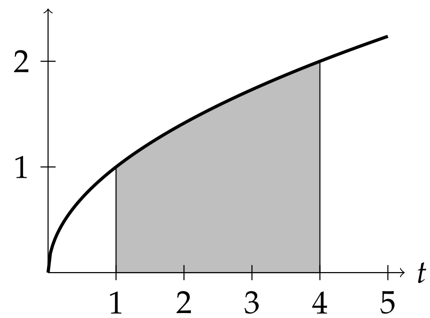
$n =$ ______ $\Delta t =$ ______ $t_i =$ __________

L: $\sum_{i=0}^{2}$ ________ = ____________________ ≈ __________

R: $\sum_{i=1}^{3}$ ________ = ____________________ ≈ __________

average L and R: __________ $\int_1^4 \sqrt{t}\,dt =$ __________

$f(t) = \sqrt{t}$

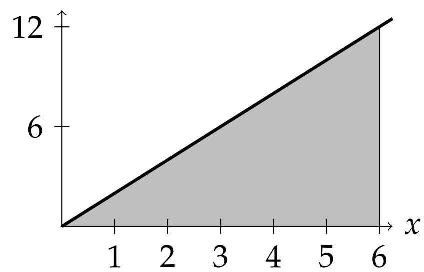


Fundamental Theorem of Calculus

$$\int_a^b \underline{\qquad\qquad}\,dx = \underline{\qquad\qquad\qquad}$$

integral of the rate of change of $F(x)$ = total change in F from a to b

$f(x) = 2x$



Compute $\int_0^6 2x\,dx$ using the Fundamental Theorem:

$F'(x) = 2x$ $F(x) =$ __________

$\int_0^6 2x\,dx =$ _________ − _________ = __________

Area on graph: _________ Do they agree?

Computing Sums and Integrals with the TI Calculator

TIs without `summation` Σ on [MATH] [0]: Sum a sequence of $f(x)$ values with `sum` and `seq`

- Use the `sum` function: [2ND] [STAT], then [►] [►] to `MATH` heading, then [5] for `sum`
- Next, the `seq` (sequence) function: [2ND] [STAT], then [►] to `OPS` heading, then [5] for `seq`
- Five `seq` arguments: `seq(`f`(X),X,`*start*`,`*end*`,1)` (use `X` from [X,T,Θ,n] as index)
- Example: Input $\sum_{i=0}^{7} i^4$ as `sum(seq(X^4,X,0,7,1))` — don't forget the last argument, `1`

Definite integrals using `fnInt` (access via [MATH] [9])

- Classic formatting: `fnInt(`f`(X),X,`*start*`,`*end*`)`
- Example: Input $\int_2^7 x^3 + 4\,dx$ as `fnInt(X^3 + 4,X,2,7)`