

MATHEMATICS 201-203-RE

Integral Calculus

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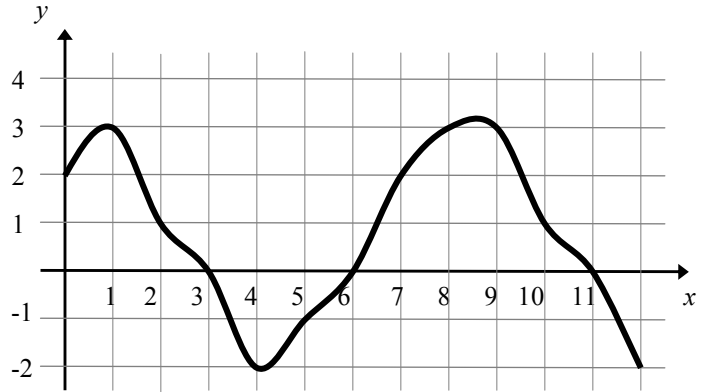
X – Approximate Integration

1. The graph of a function f is given.

Estimate $\int_0^{12} f(x) dx$ using six

subintervals with

- right endpoint approximation
- left endpoint approximation
- midpoint rule
- trapezoidal rule
- Simpson's rule



2. Estimate $\int_1^3 \frac{1}{x} dx$ to 6 decimal places with $n = 4$ using

- right endpoint approximation
- left endpoint approximation
- midpoint rule
- trapezoidal rule
- Simpson's rule
- Find the exact value.
- Find the maximum error of estimate for the midpoint rule
- Find the maximum error of estimate for the trapezoidal rule
- Find the maximum error of estimate for the Simpson's rule

3. Estimate $\int_3^9 \sqrt{x^2 - 1} dx$ to 6 decimal places with $n = 6$ using

- | | |
|---------------------------------|--------------------------------|
| a) right endpoint approximation | b) left endpoint approximation |
| a) midpoint rule | d) trapezoidal rule |
| e) Simpson's rule | |

4. Estimate $\int_0^1 e^{-x^2} dx$ to 6 decimal places with $n = 8$ using

- | | |
|-------------------|---------------------|
| a) midpoint rule | b) trapezoidal rule |
| c) Simpson's rule | |

5. Estimate $\int_1^3 \sin(x^2) dx$ to 6 decimal places with $n = 10$ using

- | | |
|-------------------|---------------------|
| a) midpoint rule | b) trapezoidal rule |
| c) Simpson's rule | |

Answers

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| 1. a) 2 | b) 10 | c) 14 |
| d) 6 | e) $\frac{20}{3}$ | |
| 2. a) 0.95 | b) 1.283333 | c) 1.089755 |
| d) 1.116667 | e) 1.1 | f) 1.098612 |
| g) $ E_M \leq \frac{1}{24} \approx 0.042$ | h) $ E_T \leq \frac{1}{12} \approx 0.083$ | i) $ E_S \leq \frac{1}{240} \approx 0.0042$ |
| 3. a) 35.446533 | b) 35.439849 | c) 35.444111 |
| 4. a) 0.747304 | b) 0.745866 | c) 0.746826 |
| 5. a) 0.474599 | b) 0.441022 | c) 0.465251 |