Math 10A with Professor Stankova
Worksheet, Discussion #22; Monday, 10/16/2017
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Numerical Integration

Example

1. True False Using the left endpoint/right endpoint/midpoint rule/trapezoid rule/Simpson's rule to approximate an integral will only give you an approximate answer and never the real answer.

2. Approximate $\int_1^2 x^2 dx$ using the midpoint rule, trapezoid rule, and Simpson's rule with $n = 6$.

Problems

3. Approximate $\int_0^1 \cos(2x) dx$ using Simpson's method with $n = 6$.

4. Approximate $\int_0^2 e^{2x} dx$ using Simpson's method with $n = 6$.

5. Approximate $\int_{-1}^1 x^3 dx$ using Simpson's method with $n = 6$.

6. Approximate $\int_1^3 \ln x dx$ using Simpson's method with $n = 6$.

7. Approximate $\int_1^2 x e^x dx$ using Simpson's method with $n = 6$.

8. Approximate $\int_1^4 \sqrt{x} dx$ using Simpson's method with $n = 6$.

Error Bounds

Examples

9. True False For calculating the error bound when using left endpoint method when approximating the integral of f on the interval $[a, b]$, we use $K_1 = f'(a)$.

10. True False The error for an integral approximation can be negative.

11. True False The error bound gives us what the exact error of using the different approximation techniques are.

12. True False The error bounds aren't helpful because they don't give us the exact error.

13. How many intervals do we need to use to approximate $\int_1^2 x^2 dx$ within $0.001 = 10^{-3}$ using the midpoint rule? Trapezoid rule? Simpson's rule?

Problems

14. How many intervals do we need to use to approximate $\int_0^1 \cos(2x) dx$ within $0.001 = 10^{-3}$ using Simpson's rule?

15. How many intervals do we need to use to approximate $\int_0^2 e^{2x} dx$ within $0.001 = 10^{-3}$ using Simpson's rule?

16. How many intervals do we need to use to approximate $\int_{-1}^1 x^3 dx$ within $0.001 = 10^{-3}$ using Simpson's rule?

17. How many intervals do we need to use to approximate $\int_1^3 \ln x dx$ within $0.001 = 10^{-3}$ using Simpson's rule?

18. How many intervals do we need to use to approximate $\int_1^2 x e^x dx$ within $0.001 = 10^{-3}$ using Simpson's rule?

19. How many intervals do we need to use to approximate $\int_1^4 \sqrt{x} dx$ within $0.001 = 10^{-3}$ using Simpson's rule?