Math 1B: Review Session

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Question 1

Using the table below, approximate

$$\int_2^4 f(x)dx$$

using the trapezoidal rule for n = 4.

x	2	2.25	2.5	2.75	3	3.25	3.5	3.75	4
f(x)	1	2	−1	0	3	2	0	−2	−3

Now, suppose you know that $|f''(x)| \leq 10$ on $[2, 4]$. What n is needed to ensure that the size of the error for your approximation is less than 0.001?

Question 2

Suppose you know that $g(2) = -1$. Using the table below, approximate the value of $g(7)$, using the midpoint rule for $n = 5$.

x	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
g'(x)	1	3	-2	-1	0	2	2	1	3	5	-3

Now, suppose you know that $|g^{(3)}(x)| \leq 4$ on $[2, 7]$. What n is needed to ensure that your approximation for $g(7)$ is within 0.001 of the actual value of $g(7)$?

Question 3

What n is needed so that the approximation using Simpson's rule for

$$\int_{-3}^{4} x^2e^{2x} + \cos(x)dx$$

is within 0.001 of the actual value?

Question 4

What n is needed so that the approximation using the trapezoidal rule for

$$\int_{-5}^{2} e^{-x} + x^2\sin(x) + \ln(3-x)dx$$

is within 0.001 of the actual value?

Question 5

Let L_4, R_4, M_4, and T_4 be the approximations using the left endpoint, right endpoint, midpoint, and trapezoidal approximations for

$$\int_{1}^{5} \sin(2x) + 3x^2dx$$

Which ones are overestimates and which ones are underestimates?

Question 6

Integrate the following "snack-bite" integrals.

$$\int \frac{1}{2x-1} + \frac{3}{(2x-1)^4}dx$$

$$\int \frac{x+3}{x^2+16}dx$$

$$\int \frac{3x-1}{x^2-4x+20}dx$$

Question 7

Compute

$$\int \frac{2x^3+9x+1}{(x^2+4)^2}dx$$

Question 8

Do the following improper integrals converge or diverge?

$$\int_1^{\infty} \frac{3+\sin(3x)}{e^{4x}} dx$$

$$\int_0^{2} \frac{\pi+\arctan(x)}{\sqrt{x}} dx$$

$$\int_3^{\infty} \frac{x-1}{x^4+x^2} dx$$

$$\int_{-1}^{0} \frac{e^{1/x}}{x^3} dx$$

(From the textbook, pg. 535)

Question 9

Find the arc length of

$$f(x) = \frac{1}{3}(x+1)^3 + \frac{1}{4(x+1)}$$

from $x = 1$ to $x = 3$.

Question 10

Find the surface area of the surface of revolution obtained by revolving the curve

$$f(x) = \cosh(x) = \frac{e^x + e^{-x}}{2}$$

from $x = -1$ to $x = 1$ around the x-axis.