Math 2300 Midterm 1 Review

Question 0.1.

- $$\int \arcsin(x)dx$$
- $$\int e^x \cos(x)dx$$
- $$\int x\sqrt{x+1}dx$$
- $$\int xe^- xdx$$
- $$\int x\sin(x)dx$$

Question 0.2. *Solve the following:*

- $$\int \frac{1}{x\sqrt{x^2+9}}$$
- $$\int \frac{3+x}{x^2+9}$$
- $$\int \frac{\sqrt{x^2-4}}{x}$$
- $$\int \frac{3}{\sqrt{4-x^2}}$$
- $$\int_0^2 4\sqrt{4-x^2}dx.$$

Question 0.3.

- $$\int \frac{5x+1}{(2x+1)(x-1)}$$
- $$\int \frac{3x+11}{x^2-x-6}dx$$
- $$\int \frac{x^2+4}{3x^3+4x^2-4x}dx$$
- $$\int \frac{x^2-29x+5}{(x-4)^2(x^2+3)}dx$$
- $$\int \frac{x^4-5x^3+6x^2-18}{x^3-3x^2}$$

- $$\int \frac{x^2}{x^2-1}dx$$

Question 0.4.

- $$\int \sin^5(x)dx$$

- $$\int \sin^6(x)\cos^3(x)dx$$

- $$\int \sin^2(x)\cos^2(x)dx$$

Question 0.5. *Calculate the maximum error in approximating*

$$\int_0^{\frac{\pi}{2}} \sin(x)dx$$

if we use the trapezoidal rule with $n = 10$ *trapezoids.*

Question 0.6. *Given that the error in using midpoint approximation to approximate*

$$\int_a^b f(x)dx$$

is given by $\frac{k(b-a)^3}{24n^2}$ *where* $k \geq f''(x)$ *on* $[a,b]$ *and* n *is the number of rectangles used, calculate the number* n *of needed to guarantee that our midpoint approximation of*

$$\int_2^3 \frac{1}{2}e^{-x}dx$$

is accurate to within 0.003. *Note: do not simplify the expression you get.*

Question 0.7.

$$\int_1^\infty \frac{1}{x^2}dx$$

Question 0.8.

$$\int_1^\infty \frac{1}{1+x^2}$$

Question 0.9. *Find the following:*

- $\sin(\frac{\pi}{3})$
- $\cos(\frac{\pi}{6})$
- $\sin(\frac{\pi}{2})$
- $\cos(\frac{\pi}{4})$
- *bonus question:* $\tan(\frac{\pi}{4})$

Question 0.10.

$$\int e^x \sin(x) dx$$

Question 0.11.

$$\int e^{2x} \sqrt{1 + e^{2x}} dx$$

Question 0.12.

$$\int_1^e 2x \ln(x) dx$$