SAMPLE

University of South Carolina

Sample Midterm Examination 1 February 10, 2022

Math 142–001/002

Closed book examination Time: 75 minutes

Name _____

Instructions:

Notes, books, computer, phones, calculators or other aids are **not** allowed. Please write on only one side of each page. If you need more space than is provided, then ask for extra paper from the proctor. Simplify your final answers. Full credit will not be awarded for insufficient accompanying work.

There are $16 + 9 + 9 + 10 + 10 + 6 = 60$ points available, but the exam is **out of** 55.
(In other words, there are 5 bonus points available)

1. (16 points) Find the following integrals.

(a) $\int 2x^4 + 3x^3 - 2x + 4 \, dx$

(b) $\int \frac{1}{x^2} + e^x + 3^x + \sqrt[3]{x} \, dx$

(c) $\int \sin(\theta) + \cos(\theta) + \tan(\theta) + \sec(\theta) \, d\theta$

(d) $\int \sec^2(t) + \sec(t)\tan(t) + \frac{1}{1+t^2} + \frac{1}{\sqrt{1-t^2}} \, dt$

2. (9 points) Find the following integrals.

(a) $\int 2xe^{x^2}\ dx$

(b) $\int 2te^{2t}\ dt$

(c) $\int \sin^6(\theta)\cos(\theta)\ d\theta$

3. (9 points) Find the following integrals.

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

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

(c) $\displaystyle\int t^2\cos(2t)\,dt$

4. (10 points) Find $\int \frac{dx}{(1-x^2)^{\frac{3}{2}}}$ for $|x| < 1$.

5. (10 points) Find the following integrals.

(a) $\displaystyle\int \frac{1}{4x^2 - 1}\, dx$

(b) $\displaystyle\int_1^{\infty} \frac{2}{3x^3}\, dx$

6. (6 points) Recall the formula for Simpson's rule is given by

$$\frac{\Delta x}{3}\Big[f(x_0) + 4f(x_1) + 2f(x_2) + \cdots + 4f(x_{n-3}) + 2f(x_{n-2}) + 4f(x_{n-1}) + f(x_n)\Big]$$

with error bound $|E_S| \leq \dfrac{M_S(b-a)^5}{180n^4}$ where M_S is an upper bound for $|f^{(4)}(x)|$ for x in $[a, b]$.

(a) Estimate the integral $\displaystyle\int_1^3 \frac{dx}{x}\, dx$ using Simpson's rule with 4 equal subintervals.

(b) What is a bound on the error in the estimate from part (a)?

The End