

University of South Carolina

Midterm Examination 1 September 30, 2021

Math 142–003/004

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 $16 + 9 + 9 + 7 + 10 + 9 = 60$ 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) $\int 4x^3 - 2x^2 + x - 1 \, dx$

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

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

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

2. (9 points) Find the following integrals.

(a) $\int r\sqrt{1-r^2} \, dr$

(b) $\int xe^{4x} \, dx$

(c) $\int \sqrt{\sin(\theta)} \cos(\theta) \, d\theta$

3. (9 points) Find the following integrals.

(a) $\int x^2 \sin(x) dx$

(b) $\int \frac{1}{e^x + e^{-x}} dx$

(c) $\int \cos^2(4t) dt$

4. (7 points) Find $\int \frac{dx}{\sqrt{9x^2 + 4}}$.

5. (10 points) Find the following integrals.

(a) $\int \frac{2}{x^2 - 16} dx$

(b) $\int_0^1 \frac{4 dx}{3x - 2}$

6. (9 points) Determine a value for each of the following or, if they do not have values, then show that they diverge or do not exist.

(a) $\lim_{n \rightarrow \infty} \frac{n^2 - n^4 + 1}{2n^3 + n - 1}$

(b) $\lim_{n \rightarrow \infty} n \sin\left(\frac{1}{n}\right)$

(c) $\sum_{n=1}^{\infty} \frac{2^n - 3^n}{5^n}$