

MATH 1352: Calculus II – Section 009

Mid Term Exam 3

- Answer all questions
- Show all steps in your calculations
- No calculators or computers allowed

1. Solve the following linear differential equation using an integrating factor

$$\frac{dy}{dx} + \frac{1}{x}y = \frac{1}{x}$$

2. Solve the following differential equation using separation of variables:

You need to separate the variables and do partial fractions

$$x y dx = (x - 4)(x - 5)dy$$

3. Calculate the following improper integrals or argue that they do not exist:

Note that the functions are discontinuous so that you need to split the integrals

i. $\int_0^3 \frac{1}{(x-1)^{5/6}} dx$

ii. $\int_{-1}^1 \frac{1}{x} dx$

4. Calculate the sum of the first n terms of the following sequences

i. $2, 4, 6, 8, 10, \dots$

ii. $1, \frac{1}{3}, \frac{1}{9}, \frac{1}{27}, \frac{1}{81}, \dots$

5. Using the integral test, determine if the following series converges or diverges.

$$\sum_{k=1}^{\infty} ke^{-k^2}$$