

## MATH 1700 D01 Fall 2017 Assignment 2

SHOW ALL WORK to get full marks. Leave answers as exact answers. For example, leave it as fractions such as  $1/7$  as opposed to decimals such as 0.142857. Word problems should have sentence answers with units. Fractions should be lowest terms.

Calculators are not permitted. Assignments using a calculator will not be graded.

All assignments must be handed in on UMLearn as **one PDF file**. Late assignments will not be accepted. Failure to follow the instructions will result in a mark of 0.

Techniques from this course must be used to solve the questions, not more advanced techniques.

The assignment covers sections 5.2–5.5, 6.1, 10.2, 10.4, 6.2–6.3 in the textbook.

Assignments are to be done independently.

1. Evaluate the following definite integrals.

[5] (a)  $\int_1^3 \left( e^t + 4^t - \frac{5}{t^4} + \frac{4}{t} \right) dt$

[5] (b)  $\int_{-\ln 2}^0 \frac{e^{2x}}{(e^{2x} - 3)^2} dx$

[5] (c)  $\int_1^{\sqrt{3}} \frac{\cot^{-1} x}{1 + x^2} dx$

[3] (d)  $\int_{-2017}^{2017} \frac{(u^4 + u^2) \sin u}{u^6 + 3} du$

[2] (e)  $\int_{-3}^4 \frac{y^3 + 25}{y^2} dy$

2. Compute the following derivatives

[3] (a)  $\frac{d}{dx} \int_1^{\cos^{-1} x} \left( \frac{e^u}{u^2 + 3} \right) du$

[5] (b)  $\frac{d}{dy} \int_{\sec y}^{y^3} \left( \frac{1}{u^{2017} + 1} \right) du$

3. Evaluate the following indefinite integrals

[4] (a)  $\int 2t(7 - 2t)^{2017} dt$

[4] (b)  $\int \sec^2 u \sin(\tan u) du$

[5] 4. Evaluate the following integral by interpreting it in terms of areas

$$\int_{-5}^0 (2 + \sqrt{25 - x^2}) dx$$

(By "interpreting in terms of area" the question means to use the relationship between the integral and the area to help solve the integral.)

- [7] 5. Draw a sketch of the region  $R$  and then calculate the area of  $R$  where  $R$  is the region bounded by the curves  $y = 6 - x^2$ ,  $y = x$  and  $y = 5x$  where  $x \geq 0$ .
- [12] 6. Draw a sketch of the region  $R$  and then calculate the volume of revolution of  $R$  where  $R$  is the region bounded by  $y = x^2 - 1$ ,  $y = 1 - x$  rotated about
- (a)  $y = -1$
- (b)  $x = 2$ .
- [5] 7. Find the area of one leaf of the polar curve  $r = 2 \cos 4\theta$ . (Hint:  $\sin^2 x = \frac{1 - \cos 2x}{2}$ ,  $\cos^2 x = \frac{1 + \cos 2x}{2}$ )
- [5] 8. Find the area inside both the circle  $r = 3$  and the cardioid  $r = 2 + 2 \cos \theta$ .
- [5] 9. Use parametric equations to compute the area inside the ellipse

$$x = 2 \cos t, y = 5 \sin t, 0 \leq t \leq 2\pi.$$

This assignment is out of 75 points.