

## MATH 2072 EXAM 2 REVIEW

★ Note that calculators and scratch paper will not be allowed during the exam.

**Section 6.6** Two types of improper integrals were defined. Be able to determine when such integrals are convergent or divergent and when they do converge, evaluate them. The Comparison Theorem gave us a way of comparing improper integrals to determine convergence or divergence.

**Section 7.2** Be able to find the volume of a solid using the “cross-section” method. Sometimes the solids will be described by rotating a region of the  $xy$ -plane about a horizontal or vertical line. Other problems describe a solid that you must position relative to the  $xy$ -plane.

**Section 7.3** Use the “cylindrical shells” method to find the volume of a solid. You may be given a solid in which only one of these two methods work.

**Section 7.4** Given a smooth function  $y = f(x)$  ( $f'$  is continuous), find the length of the curve over the interval  $a \leq x \leq b$ :

$$\text{Arc Length} = \int_a^b \sqrt{1 + (f'(x))^2} dx.$$

Of course, the roles of  $x$  and  $y$  may be switched.

**Areas of Surfaces of Revolution** Find the area of a surface of revolution. If a curve is rotated about the  $x$ -axis, use the form  $\int 2\pi y ds$  and if it is rotated about the  $y$ -axis, use the form  $\int 2\pi x ds$ . If the curve is defined by  $y = f(x)$ , where  $f$  is smooth and defined for  $a \leq x \leq b$ , then the bounds of integration are  $a$  and  $b$  and

$$ds = \sqrt{1 + (f'(x))^2} dx.$$

If the curve is defined by  $x = g(y)$ , where  $g$  is smooth and defined for  $c \leq y \leq d$ , the bounds of integration are  $c$  and  $d$  and

$$ds = \sqrt{1 + (g'(y))^2} dy.$$

**Section 7.5** We began this section by defining *force* and *work* in the case where force is constant. You should be able to work problems using metric units ( $m, kg, N, J, \dots$ ). Work was also defined when force can be described along a straight line by a continuous function  $f(x)$ . Hooke’s Law gave a nice application of such a function. Be able to work problems similar to the homework, including the “tank” problems. The second topic we

covered in this section was hydrostatic pressure. Know how pressure is defined and find the force due to hydrostatic pressure exerted on a vertical plate submerged in a fluid.

**Section 7.6** We defined differential equation, order, and solution and we learned to solve separable equations (for general solutions and initial-value problems). Important examples included finding orthogonal trajectories, the law of natural growth, and logistic equations.

**Other** In addition to the topics listed above you should be able to work problems similar to the examples covered in class and the assigned homework problems listed below.

## ASSIGNED HOMEWORK PROBLEMS

**Section 6.6** # 3, 5, 7, 9, 11, 13, 17, 19, 29, 33, 34, 41, 42, 47, 51

**Section 7.2** # 1, 3, 5, 7, 9, 11, 13, 25, 26, 32, 34, 35, 41

**Section 7.3** # 3, 5, 7-9, 11, 13, 15, 17, 33, 37

**Section 7.4** # 3, 5, 7, 9, 13, 26

### Areas of Surfaces of Revolution Handout

**Section 7.5** # 6-8, 10, 15, 17, 23, 27, 30

**Section 7.6** # 1, 3, 5, 7, 9, 11, 13, 15, 21-24, 35, 37, 40

### Solutions to Supplementary Problems

- (a)  $49\pi$  (b)  $\frac{\pi}{6} (37^{3/2} - 17^{3/2})$  (c)  $\frac{\pi}{24} (65^{3/2} - 17^{3/2})$
- (a)  $\frac{\pi}{27} (145^{3/2} - 10^{3/2})$  (b)  $\frac{\pi}{6} (5^{3/2} - 1)$  (c)  $\pi a^2$
- Both improper integrals converge.