AP CALCULUS (BC) NAME \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Chapter 7 – Applications of the Definite Integral Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Section 7.1 – Integrals as Net Change**

1) Linear Motion (Motion along a single line/axis)

1. Determining (Future) Position Given Velocity and Initial Position – page 379
2. Method 1 – Displacement (Example 2 on page 379)
3. Method 2 – Indefinite Integrals and IVPs (Exploration 1/page 381)
4. (Total) Distance Traveled – Example 3 on page 381
5. Acceleration – Example 4 on page 381

**Homework 7.1a: Page 386 # 3, 4, 5, 9, 12 – 16, 19**

2) “Other” Net Changes

1. Consumption/Accumulation – Example 5 on page 383

**Homework 7.1b: Page 386 # 21, 23**

1. Work (Hooke’s Law) – Example 7 on page 385

**Homework 7.1c: Page 386 # 29**

3) Approximating Net Change from Data – Example 6 on page 384

**Homework 7.1d: Page 386 # 27, 31 – 36**

**Section 7.2 – Areas in the Plane**

1) Area Between Two Curves

1. Definition
2. Area Between Two Curves on an Interval – Example 1 (page 391)
3. Area Between Two Intersecting Curves – Examples 2 and 3 (pages 391-2)

**Homework 7.2a: Page 395 # 5, 7, 28, 29,**

1. Areas of Regions with Multiple Boundaries – Example 4 (page 392)
   1. Method 1
   2. Method 2
   3. Method 3

**Homework 7.2b: Page 395 # 3, 4, 9, 11, 23, 27, 37, 39, 49**

**Section 7.3 – Volumes of Solids**

1) Volumes of Solids of ***Known Cross-sectional Area***

1. Derivation of formula using Riemann Sums

; where A(x) is the area of a cross section for the solid on [a, b].

1. Examples – Page 406 # 2a and Page 408 # 40b
2. Steps to follow in the method of ***Known Cross-sectional Area***
3. *Sketch the function (and the solid produced)*
4. *Draw a segment representing a typical cross sectional (perpendicular to an axis);*
5. *Determine the shape of the cross section and the appropriate area formula;*
6. *Determine the variable of integration and the limits of integration; and*
7. *Set up an integral expression; and integrate*

**Homework 7.3a: Page 406 # 1abcd, 2b, 3, 39, 40**

2) Volumes of ***Solids of Revolution*** (This type always produces ***Circular Cross Sections***)

1. Problem Statement – Given a bounded region, defined by the intersections of one or more functions on an interval; Determine the volume of the solid generated when that region is revolved about some axis of revolution (not always the x- or y-axis).

Using , and the fact that , we get

; where *r* is the distance from the axis of revolution to the boundary curve.

1. Example: Given: The region, **R**, bounded by and the **x-axis** from **x = 0** to **x = 9;**

Find:The volume of the solid generated when **R** is revolved about the x-axis.

1. Steps to follow in the method of ***Solids of Revolution***
2. *Sketch the Region on [a, b];*
3. *Draw a circular cross section (perpendicular to the axis of revolution);*
4. *Determine which variable you must integrate with respect to;*
5. *Determine r, as a function of the variable you are integrating wrt;*
6. *Set up an integral expression; and integrate*

**Homework 7.3b: Page 406 # 11, 14**

1. Other Examples (What if…?):
2. Let **R** be the regions bounded by: **y = x2**, **y = 4**, and **x = 1**. Determine the volume generated when **R** is revolved about the **x-axis**.

ii. Let **R** be the region bounded by: **y = ln x**, **y = 2**, **and x = 1**. Determine the volume

generated when **R** is revolved about the line **y = 2**.

iii. Let **R** be the region bounded by: **y = x2**, **y = 4**, and the **y-axis**. Determine the

volume generated when **R** is revolved about the line **y = -1.**

**Homework 7.3c: Page 406 #15, 17**

iv. Let R be the region bounded by: **y = x2** and **y = x.**

1. Determine the volume generated when **R** is revolved about the **x-axis**;
2. Determine the volume generated when **R** is revolved about the **y-axis**;

**Homework 7.3d: Page 406 # 27, 28, 29, 46**

**Section 7.4 – Length of a Curve**

Do you recall the activity on the first of class in September? Well, you’re finally going to get a definitive answer to the problem posed by that question…How to determine the length of a curve on a closed interval!

1. Consider: A continuous function, ***y = f(x)*** on **[a, b]**. Find the length of **f(x)** on **[a, b].**

Derive a method for determining the length of the curve.

1. Examples:
2. Let *y =*  on [0, 1]. Determine the length on [0, 1].
3. Set up and evaluate an integral expression to determine the length of one full cycle of the sine curve.

**Homework 7.4a: Page 416 # 2, 7, 12, 19, 22, 37**

1. Set up and evaluate an integral expression to determine the length of the curve, x = y3 from y = -2 to y = 2.

**Homework 7.4b: Page 416 # 4, 8**

**Chapter 7 Review Exercises:**

**Page 429 # 1, 3;**

**Page 430 # 1 – 13 odd, 21, 25 – 31 odd, 39, 53**