APPLICATION OF INTEGRALS REVIEW

Note: To measure any vertical distance, use "top – bottom". $\Big|_{bottom}^{top}$

To measure any horizontal distance (left_____right), use "right -left"

7.1 (1) **Area between curves**: There is no p in these formulas.

a) Use "top – bottom" idea.

$\int_a^b [f(x) - g(x)]\,dx$

b) Use "right – left" idea.

$\int_c^d [f(y) - g(y)]\,dy$

7.2-3 (2) **Volumes**

a) **Disks:** The Formula $\int_a^b p\,[f(x)]^2\,dx$ is of limited use.

Use $\int p r^2$ with perpendicular cross-sections.

b) **Washers:** the formula $\int_a^b p\left[(f(x))^2 - (g(x))^2\right]dx$ is also of limited use. Instead use

$\int p\left[R^2 - r^2\right]$ with perpendicular cross-sections.

c) **Shells**: The formula $\int_a^b 2p\,x f(x)\,dx$ is also limited. Use

$\int 2p\,rh$ with parallel cross-sections.

Note: Sometimes in (1) and (2) we need to split the integral.

7.4 (3) **Arc Length**: (No p in these formulas)

a) $\int_a^b \sqrt{1+[f'(x)]^2}\,dx$ *or* $\int_a^b \sqrt{1+\left(\frac{dy}{dx}\right)^2}\,dx$

b) $\int_c^d \sqrt{1+[f'(y)]^2}\,dy$ *or* $\int_c^d \sqrt{1+\left(\frac{dx}{dy}\right)^2}\,dy$

In some problems, the expression under the radical will be perfect square. In others use a u-substitution.

7.7 (4) **Work**

a) Spring problems: $F = kx$ is Hooke's Law. First solve for k, then integrate. b) Set up cone and cylinder problems from scratch.