Please note. This is **NOT** the formula sheet. It is intended as a study aid only.

Volume of Solids of Revolution Summary

METHOD	*Rev about* $x-axis$	*Rev about* $y-axis$
WASHERS	$\pi \int_a^b \left[(R_o(x))^2 - (r_I(x))^2 \right] dx$	$\pi \int_c^d \left[(R_o(y))^2 - (r_I(y))^2 \right] dy$
SHELLS	$2\pi \int_c^d y\, h(y)\, dy$	$2\pi \int_a^b x\, h(x)\, dx$

The "a" and "b" limits of integration are values of x. The "c" and "d" limits of integration are values of y.

For the **Washer Method** "R_o" is the "Outer Radius" which is the distance from the axis of revolution to the outer wall of the solid, while "r_I" is the "Inner Radius" which is the distance from the axis of revolution to the inner wall of the solid.

When the axis of revolution is the x-axis, R_o and r_I are written as functions of x.

When the axis of revolution is the y-axis, R_o and r_I are written as functions of y.

For the **Shell Method** "h" is the "height" of the cylindrical shell.

When the axis of revolution is the x-axis, the "height" of the shell is measured with respect to the y-axis. In this case, "h" is written as a function of y.

When the axis of revolution is the y-axis, the "height" of the shell is measured with respect to the x-axis. In this case, "h" is written as a function of x.

Radical - Trigonometric Substitution Summary

Integral contains	*substitute for* x	*substitute for* dx
$\sqrt{a^2 - x^2}$	$x = a\sin\theta$	$dx = a\cos\theta\, d\theta$
$\sqrt{x^2 - a^2}$	$x = a\sec\theta$	$dx = a\sec\theta\tan\theta\, d\theta$
$\sqrt{a^2 + x^2}$	$x = a\tan\theta$	$dx = a\sec^2\theta\, d\theta$