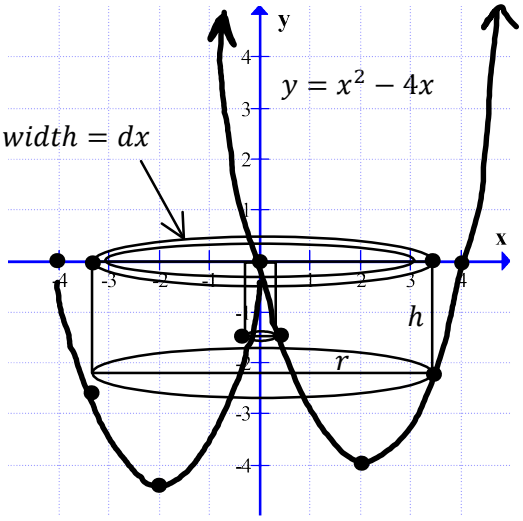
# C12 - 5.14 - Cylindrical Shells Int Notes

| Revolution about y-axis | $V = 2\pi \int_a^b xydx$ | $V = 2\pi \int_a^b rhdx$ | $r, x = shell\ radius$<br>$h, y = shell\ height$ |
|---|---|---|---|

$SA = Ch$
$SA = 2\pi rh$




$$V = 2\pi \int_a^b xydx$$ X-LAND (y-axis)

$$V = 2\pi \int_0^4 x(x^2 - 4x)dx$$

$$V = 2\pi \int_0^4 (x^3 - 4x^2)dx$$

$$V = 2\pi \left(\frac{x^4}{4} - \frac{4x^3}{3}\right)\Big|_0^4$$

$$V = 2\pi \left(\left(\frac{4^4}{4} - \frac{4(4)^3}{3}\right) - (0)\right)$$

$$V = 2\pi \left(64 - \frac{256}{3}\right) = -\frac{128\pi}{3} = -134.04$$

$y = x^2 - 4x$
$y = x(x - 4)$

$x = 0$ $x = 4$

$$V = \pi \int_0^4 \left((r_{outer})^2 - (r_{inner})^2\right)dx = \pi \int_0^4 \left(\left(\sqrt{y+4} + 2\right)^2 - \left(-\sqrt{y+4} + 2\right)^2\right)dy$$ Y-LAND (y-axis)

$a^2 - b^2 = (a + b)(a - b)$

$$= \pi \int_0^4 \left(4 + 2\sqrt{y+4}\right)dy$$

$$= \pi \left(4y + \frac{4(y+4)^{\frac{2}{3}}}{3}\right)\Big|_0^4$$

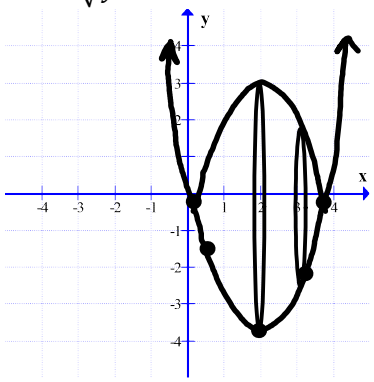
$$= 111.53$$

$y = x^2 - 4x$
$y = (x^2 - 4x + 4) - 4$
$y = (x - 2)^2 - 4$
$\pm\sqrt{y+4} = x - 2$
$x = \pm\sqrt{y+4} + 2$

Complete Square

| Revolution about x-axis | $V = 2\pi \int_a^b yxdy$ | $V = 2\pi \int_a^b rhdx$ | $r, y = shell\ radius$<br>$h, x = shell\ height$ |
|---|---|---|---|

$x = -\sqrt{y+4} + 2$ $x = +\sqrt{y+4} + 2$



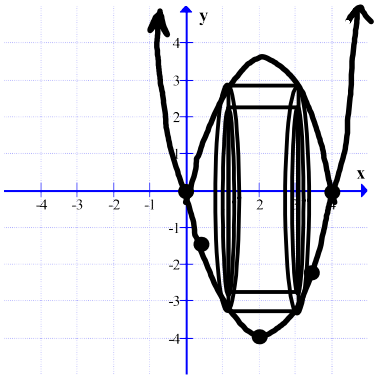

$$V = 2\pi \int_a^b yxdy$$ Y-LAND (x-axis)

$$V = 2\pi \int_2^4 y(\sqrt{y+4} + 2)dy$$

$$V = 175.848$$

$$V = 175.848 \times 2$$
$$V = 351.69.9$$

$y = x^2 - 4x$




$$V = \pi \int_0^4 (x^2 - 4x)^2 dx$$

$$V = \pi \int_0^4 (x^4 - 8x^3 + 16x^2)dx$$

$$V = \pi \left(\frac{x^5}{5} - 2x^4 + \frac{16x^3}{3}\right)\Big|_0^4$$

$$V = 107.23$$