AP Calculus BC

Volume of Solids (Rotation)

1) Disc

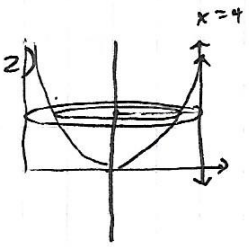
$V = \pi \int R^2$

$8 - x^{3/2} = 0 \quad @ \quad x = 4$

$V = \pi \int_0^4 (8 - x^{3/2})^2 dx$

$= 361.911$

2)



dy - WASHER

$V = \pi \int R^2 - \pi \int r^2$

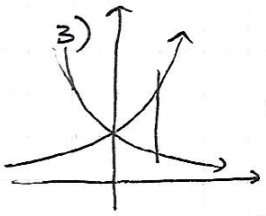
$x = \sqrt{y} \quad R = \sqrt{y} \quad r = 4$

$V = \pi \int_0^{16} 16\, dy - \pi \int_0^{16} y \cdot dy$

$\pi \left[16y\right]_0^{16} - \pi \left[\frac{1}{2}y^2\right]_0^{16}$

$\pi \left[256\right] - \pi \left[128\right] = \boxed{128\pi}$

3)



dx - WASHER

$V = \pi \int R^2 - \pi \int r^2$

$R = e^x \quad r = e^{-x}$

$V = \pi \int_0^1 (e^x)^2 dx - \pi \int_0^1 (e^x)^2 dx$

$\boxed{(D)}$

4) a) $y_1 = x^2 + 1 \quad y_2 = x$

WASHER

$V = \pi \int_0^1 (y_1)^2 dx - \pi \int_0^1 (y_2)^2 dx = 4.817$

b) WASHER

$V = \pi \int_0^1 \left[y_1 - (-1)\right]^2 dx - \pi \int_0^1 \left[y_2 - (-1)\right]^2 dx = 10.053$

c) WASHER

$V = \pi \int_0^1 \left[3 - y_2\right]^2 dx - \pi \int_0^1 \left[3 - y_1\right]^2 dx = 10.891$

d) dy - disc & WASHE

$y = x^2 + 1$

$x = \sqrt{y - 1} \quad x = 1$

$V = \pi \int_0^1 y^2 dy + \pi \int_1^2 1^2 dy - \pi \int_1^2 (\sqrt{y-1})^2 dy = 2.61799$