1. $y = x^2$ and $y = 4$; about the x-axis.

(A) $\frac{64\pi}{5}$ (B) $\frac{512\pi}{15}$ (C) $\frac{256\pi}{5}$

(D) $\frac{128\pi}{5}$ (E) none of these

2. $y = \ln x$, $y = 0$, $x = e$; about the line $x = e$.

(A) $\pi \int_1^e (e - x) \ln x \, dx$ (B) $\pi \int_0^1 (e - e^y)^2 \, dy$ (C) $2\pi \int_1^e (e - \ln x) \, dx$

(D) $\pi \int_0^e (e^2 - 2e^{y+1} + e^{2y}) \, dy$ (E) none of these

3 $y = x^2$ and $y = 4$; about the line $y = -1$.

(A) $4\pi \int_{-1}^4 (y + 1) \sqrt{y} \, dy$ (B) $2\pi \int_0^2 (4 - x^2)^2 \, dx$ (C) $\pi \int_{-2}^2 (16 - x^4) \, dx$

(D) $2\pi \int_0^2 (24 - 2x^2 - x^4) \, dx$ (E) none of these

4. $y = 3x - x^2$ and $y = 0$; about the x-axis.

(A) $\pi \int_0^3 (9x^2 + x^4) \, dx$ (B) $\pi \int_0^3 (3x - x^2)^2 \, dx$ (C) $\pi \int_0^{\sqrt{3}} (3x - x^2) \, dx$

(D) $2\pi \int_0^3 y \sqrt{9 - 4y} \, dy$ (E) $\pi \int_0^{9/4} y^2 \, dy$

5. $y = 3x - x^2$ and $y = x$; about the x-axis.

(A) $\pi \int_0^{3/2} [(3x - x^2)^2 - x^2] \, dx$ (B) $\pi \int_0^2 (9x^2 - 6x^3) \, dx$

(C) $\pi \int_0^2 [(3x - x^2)^2 - x^2] \, dx$ (D) $\pi \int_0^3 [(3x - x^2)^2 - x^4] \, dx$

(E) $\pi \int_0^3 (2x - x^2)^2 \, dx$

6. $y = x^2$, $x = 2$, and $y = 0$; about the y-axis.

(A) $\frac{16\pi}{3}$ (B) 4π (C) $\frac{32\pi}{5}$ (D) 8π (E) $\frac{8\pi}{3}$

7. The first quadrant region bounded by $y = x^2$, the y-axis, and $y = 4$; about the y-axis.

(A) 8π (B) 4π (C) $\frac{64\pi}{3}$ (D) $\frac{32\pi}{3}$ (E) $\frac{16\pi}{3}$

8 The area bounded by the parabola $y = 2 - x^2$ and the line $y = x - 4$ is given by

(A) $\int_{-2}^3 (6 - x - x^2) \, dx$ (B) $\int_{-2}^1 (2 + x + x^2) \, dx$ (C) $\int_{-3}^2 (6 - x - x^2) \, dx$

(D) $2\int_0^{\sqrt{2}} (2 - x^2) \, dx + \int_{-3}^2 (4 - x) \, dx$ (E) none of these

9. If the curves of $f(x)$ and $g(x)$ intersect for $x = a$ and $x = b$ and if $f(x) > g(x) > 0$ for all x on (a, b), then the volume obtained when the region bounded by the curves is rotated about the x-axis is equal to

(A) $\pi \int_a^b f^2(x) \, dx - \int_a^b g^2(x) \, dx$

(B) $\pi \int_a^b [f(x) - g(x)]^2 \, dx$

(C) $2\pi \int_a^b x[f(x) - g(x)] \, dx$

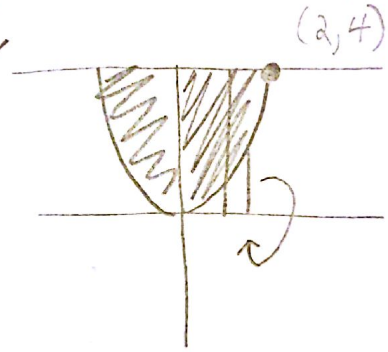
(D) $\pi \int_a^b [f^2(x) - g^2(x)] \, dx$

(E) none of these

Mult Choice Practice: Volume

1) $y=x^2$, $y=4$ about x-axis

C



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

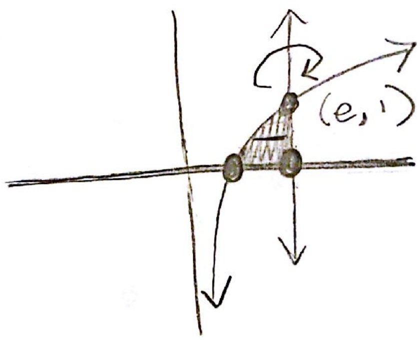
$$V=\pi\int_0^2(16-x^4)\,dx$$

$$V=\pi\cdot\left(16x-\frac{x^5}{5}\Big|_0^2\right)=\pi\left(32-\frac{32}{5}\right)$$

$$=\frac{128\pi}{5}\cdot 2=\frac{256\pi}{5}$$

2) $y=\ln x$, $y=0$, $x=e$ about $x=e$

B

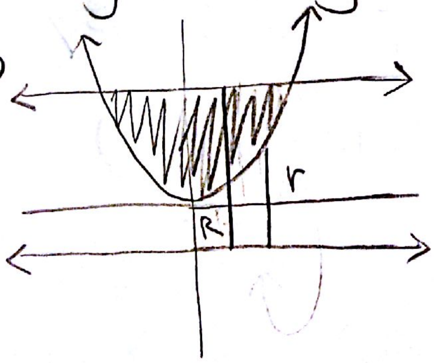


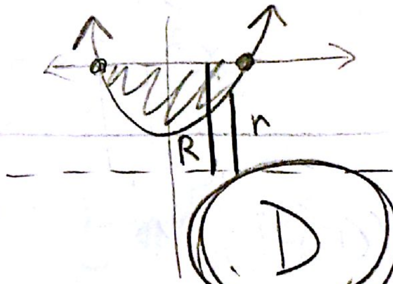
$$V=\pi\int_0^1(e-e^y)^2\,dy$$

$e^y=x$

3) $y=x^2$, $y=4$ about $y=-1$

D





$$\int_{-2}^{2}(4-(-1))^2-(x^2-1)^2\,dx$$

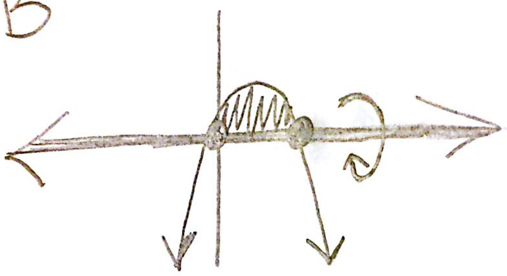
D

$25-(x^4-2x^2+1)$

$-x^4+2x^2+24$

4) $y = 3x - x^2$ and $y = 0$ about x-axis

B



$3x - x^2 = 0$

$x^2 - 3x = 0$

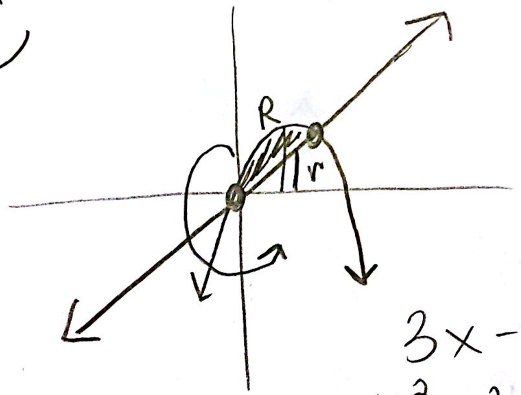
$x(x-3) = 0$

$x = 0, 3$

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

5) $y = 3x - x^2$, $y = x$, about x-axis

C



$$\pi \int_0^2 \left[(3x - x^2)^2 - x^2\right] dx$$

$3x - x^2 = x$

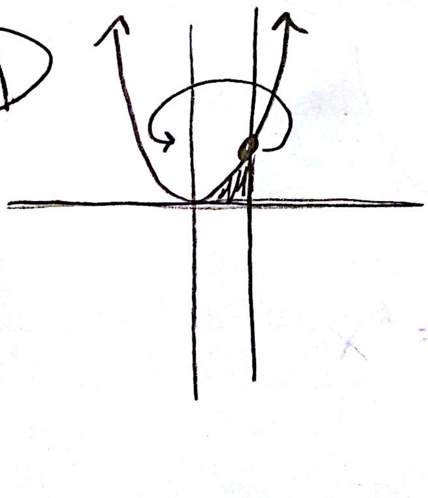
$x^2 - 2x = 0$

$x = 0, 2$

$x = \sqrt{y}$

6) $y = x^2$, $x = 2$, $y = 0$ about y-axis

D



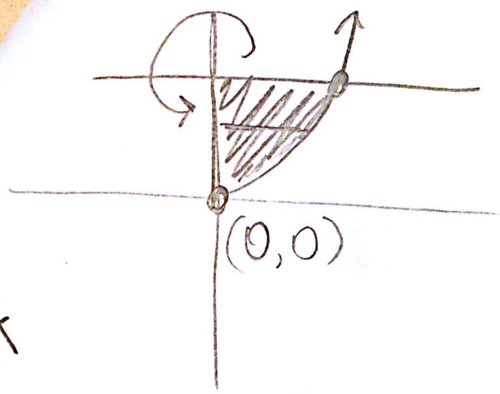
$$\pi \int_0^4 2^2 - (\sqrt{y})^2 \, dy = \pi \left(4y - \frac{y^2}{2} \Big|_0^4\right)$$

$$\pi \int_0^4 (4 - y) \, dy$$

$\pi(16 - 8)$

8π

$y = x^2$, y-axis, $y = 4$, around y-axis



(0,0)

A

$x = \sqrt{y}$

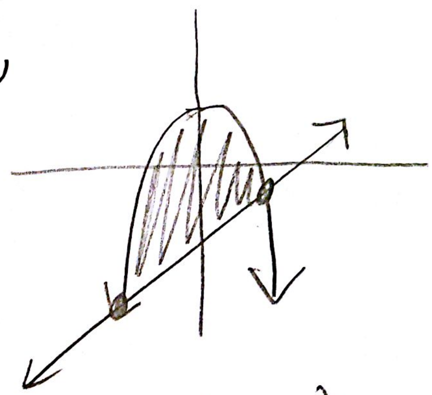
$$V = \pi \int_0^4 (\sqrt{y})^2 \, dy$$

$$= \pi \int_0^4 y \, dy$$

$$= \pi \left(\frac{y^2}{2} \Big|_0^4 \right) = \pi(8)$$

8) $y = 2 - x^2$, $y = x - 4$

C



Area =

$$\int_{-3}^{2} 2 - x^2 - x + 4 \, dx$$

$$\int_{-3}^{2} (-x^2 - x + 6) \, dx$$

$2 - x^2 = x - 4$

$x^2 + x - 6 = 0$

$(x+3)(x-2) = 0$

$x = -3, 2$

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9) D

$$\pi \int_a^b f(x)^2 - g(x)^2 \, dx$$

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