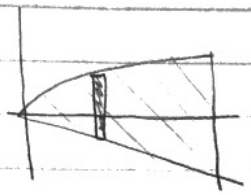
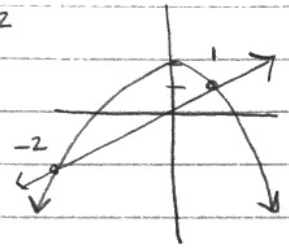
A. 1. $y = \sqrt{x}$
$x = 4$
$y = -\frac{1}{4}x$



$A = \int_0^4 \sqrt{x} - (-\frac{1}{4}x)\,dx = \boxed{7.333}$

2. $y = 2 - x^2$
$y = x$

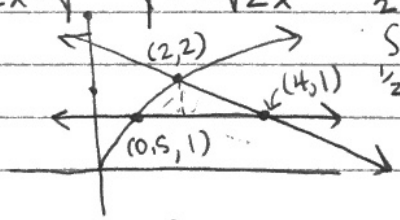


$2 - x^2 = x$
$0 = x^2 + x - 2$
$0 = (x+2)(x-1)$
$x = 1, -2$

$A = \int_{-2}^{1} (2 - x^2 - x)\,dx = 2x - \frac{1}{3}x^3 - \frac{1}{2}x^2 \Big]_{-2}^{1}$

$(2\cdot 1 - \frac{1}{3}(1)^3 - \frac{1}{2}(1)^2) - (2\cdot -2 - \frac{1}{3}(-2)^3 - \frac{1}{2}(-2)^2)$
$(2 - \frac{1}{3} - \frac{1}{2}) - (-4 + \frac{8}{3} - 2)$
$2 - \frac{1}{3} - \frac{1}{2} + 4 - \frac{8}{3} + 2$
$8 - \frac{1}{2} - \frac{1}{3} - \frac{8}{3}$
$8 - \frac{9}{3} - \frac{1}{2} = 8 - 3 - \frac{1}{2} = \boxed{4.5}$

3. $x = \frac{1}{2}y^2$ $\quad 2x = y^2$ $\quad y = \pm\sqrt{2x}$
$y = 1$
$y = -\frac{1}{2}x + 3$

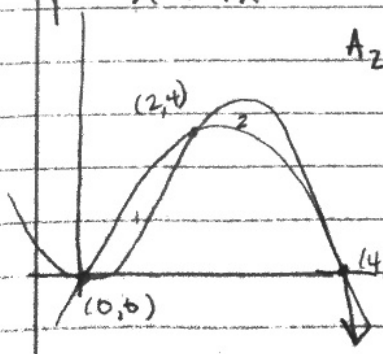


$\int_{1/2}^{2} (\sqrt{2x} - 1)\,dx + \int_{2}^{4} (-\frac{1}{2}x + 3 - 1)\,dx =$
$\boxed{1.833}$

4. $y = -\frac{x^3}{2} + 2x^2$
$y = -x^2 + 4x$

$A_1 = \int_0^2 (-x^2 + 4x) - (-\frac{x^3}{2} + 2x^2)\,dx = 2$

$A_2 = \int_2^4 (-\frac{x^3}{2} + 2x^2) - (-x^2 + 4x)\,dx = 2$

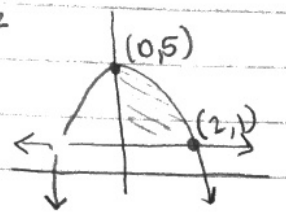


$A_1 + A_2 = \boxed{4}$

B. 1. $y = 5 - x^2$

x-axis

$y = 1$



$5 - x^2 = 1$

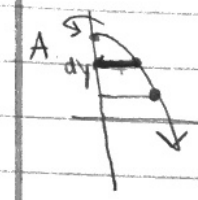
$x^2 = 4$

$x = \pm 2$

$y = 5 - x^2$

$x^2 = 5 - y$

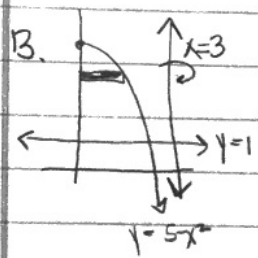
$x = \pm\sqrt{5-y}$



$$\pi \int_1^5 (\sqrt{5-y})^2 dy = \pi \int_1^5 (5-y)\,dy = \pi\left[5y - \tfrac{1}{2}y^2\right]_1^5$$

$$\pi\left[\left(5(5) - \tfrac{1}{2}(5)^2\right) - \left(5(1) - \tfrac{1}{2}(1)^2\right)\right]$$

$$\pi\left[25 - 12.5 - 5 + 0.5\right] = \boxed{8\pi \approx 25.133}$$

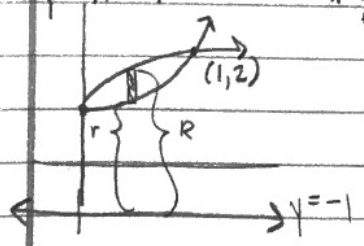


$$\pi \int_1^5 \left(3^2 - (3-\sqrt{5-y})^2\right) dy = \boxed{24\pi \approx 75.398}$$

2. $y = \sqrt{x} + 1$

$y = x^2 + 1$

$$\pi \int_0^1 \left(\sqrt{x}+1-(-1)\right)^2 - \left(x^2+1-(-1)\right)^2 dx \approx \boxed{5.131}$$



3. $x = -y^2 + 2$

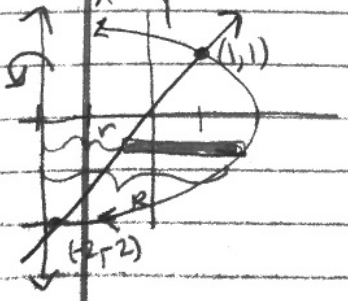
$x = y$

$y^2 = 2 - x$

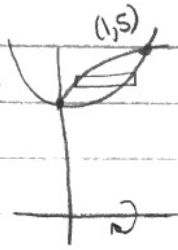
$y = \pm\sqrt{2-x}$

$$\pi \int_{-2}^1 \left(-y^2+2-(-2)\right)^2 - \left(y-(-2)\right)^2 dy$$

$$\boxed{\frac{108\pi}{5} \approx 67.858}$$



C. 1. $y = \sqrt{x} + 4$ $\quad y = x^2 + 4$



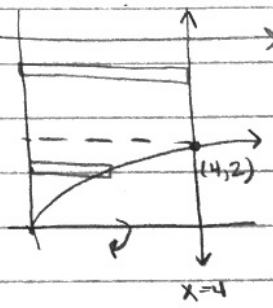
$y - 4 = \sqrt{x}$ $\quad x = (y-4)^2$ $\quad y - 4 = x^2$ $\quad x = \pm\sqrt{y-4}$

$$2\pi \int_4^5 y\left(\sqrt{y-4} - (y-4)^2\right) dy \approx 9.320$$

2. $y = \sqrt{x}$ $\quad y = 7$ $\quad x = 0$ $\quad x = 4$

If $y = x^2$

$y^2 = x$



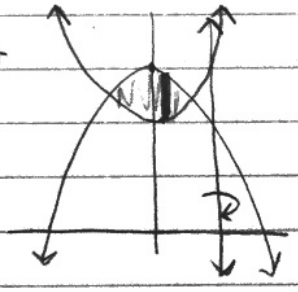
$$2\pi \int_0^2 y\,(y^2)\,dy + 2\pi \int_2^7 y\,(4)\,dy$$

$188\pi \approx 590.619$

3. $y = -x^2 + 7$

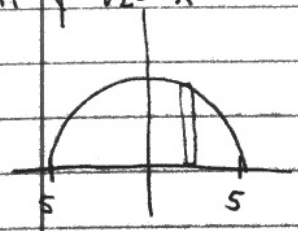
$y = x^2 + 5$

AOR $x = 2$



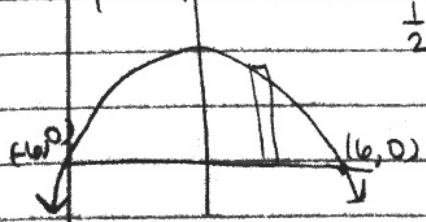
$$2\pi \int_{-1}^{1} (2-x)\left(-x^2+7-(x^2+5)\right) dx = 33.510$$

D. 1. $y = \sqrt{25 - x}$



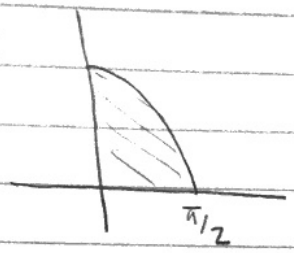
$$\int_{-5}^{5} \left(\sqrt{25-x^2}\right)^2 dx = 166.667$$

2. $y = -\frac{1}{9}x^2 + 4$

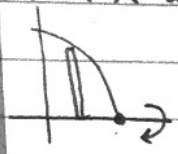


$$\frac{1}{2}\pi \int_{-6}^{6} \left[\frac{1}{2}\left(-\frac{1}{9}x^2+4\right)\right]^2 dx = 40.212$$

E. $y = \cos x$

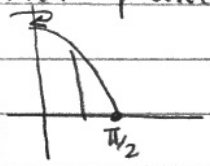


1. AOR x-axis



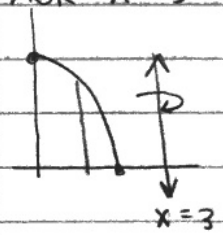
$$V = \pi \int_0^{\pi/2} [\cos x]^2 dx \approx \boxed{2.467}$$

2. AOR y-axis



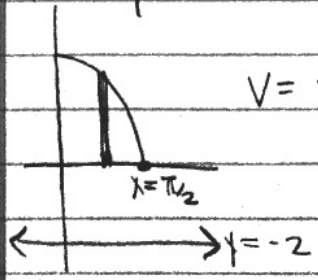
$$V = 2\pi \int_0^{\pi/2} x \cos x \, dx = \boxed{3.586}$$

3. AOR $x = 3$



$$V = 2\pi \int_0^{\pi/2} (3 - x)\cos x = \boxed{15.263}$$

4. AOR $y = -2$



$$V = \pi \int_0^{\pi/2} [\cos x - (-2)]^2 - [0 - (-2)]^2 \, dx = \boxed{15.034}$$