3.
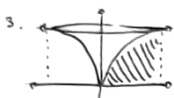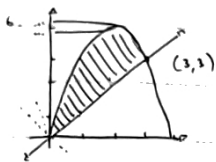

$$\int_0^1 2\pi x \cdot x^{1/3}\, dx$$

$$= 2\pi \int_0^1 x^{4/3}\, dx$$

$$= 2\pi \left[\frac{3}{7} x^{7/3} \right]_0^1$$

$$= 2\pi \left[\frac{3}{7} \right]$$

$$\boxed{= \frac{6\pi}{7}}$$
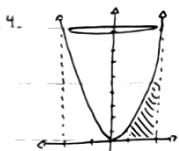
4.

$$\int_1^2 2\pi x \cdot x^3\, dx$$

$$= 2\pi \int_1^2 x^4\, dx$$

~~(crossed out)~~

$$= 2\pi \left[\frac{1}{5} x^5 \right]_1^2$$

$$\boxed{= \frac{62\pi}{5}}$$

5.

$$\int_0^2 2\pi x \cdot x^2\, dx$$

$$= 2\pi \int_0^2 x^3\, dx$$

$$= 2\pi \left[\frac{1}{4} x^4 \right]_0^2$$

$$= 2\pi (4)$$

$$\boxed{= 8\pi}$$

6.

(2,3)

$$\int_0^3 2\pi x \cdot \left((4x - x^2) - x \right)\, dx$$

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

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

~~(crossed out)~~

$$= 2\pi \left[x^3 - \frac{1}{4} x^4 \right]_0^3$$

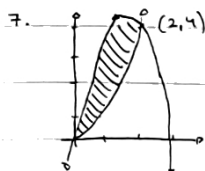$$= 2\pi \left(\frac{27}{4} \right) = \boxed{\frac{27\pi}{2}}$$

7.

(2,4)

~~(crossed out)~~

~~(crossed out)~~

~~(crossed out)~~

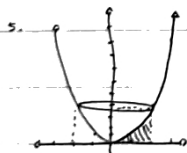$$\int_0^2 2\pi x \cdot \left((6x - 2x^2) - x^2 \right)\, dx$$

~~(crossed out)~~

$$= 2\pi \int_0^2 x \cdot (6x - 3x^2)\, dx$$

$$= 6\pi \int_0^2 (2x^2 - x^3)\, dx$$

$$= 6\pi \left[\frac{2}{3} x^3 - \frac{1}{4} x^4 \right]_0^2$$

$$= 6\pi \left(\frac{4}{3} \right)$$

$$\boxed{= 8\pi}$$