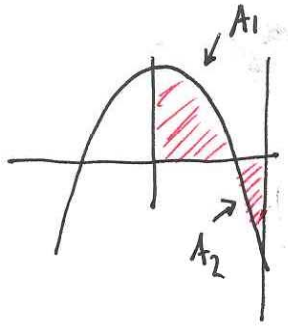
Key v 18

1.

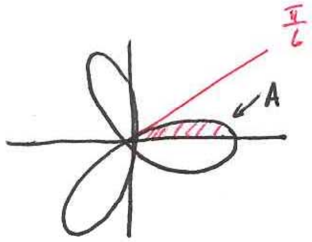


$$A_1 = \int_0^3 (18-2x^2)\,dx = 36$$

$$A_2 = \int_3^4 \left[0-(18-2x^2)\right]dx = \frac{20}{3}$$

$$\text{Area} = 36 + \frac{20}{3} = \frac{128}{3}$$

2.



$$A = \frac{1}{2}\int_0^{\frac{\pi}{6}} \left[4\cos 3\theta\right]^2 d\theta$$

$$= 8\int_0^{\frac{\pi}{6}} \frac{1+\cos 6\theta}{2}\,d\theta$$

$$= 4\left[\theta + \frac{\sin 6\theta}{6}\right]\Bigg|_0^{\frac{\pi}{6}} = \frac{4\pi}{6}$$

Area of one petal $= 2A$

$= \frac{4\pi}{3}$

3.

$$S = 2\left[\int_0^{\frac{\pi}{6}} \sqrt{(4\cos 3\theta)^2 + (-12\sin 3\theta)^2}\,d\theta\right]$$

4 a)

$$V = 2\pi\int_0^2 x\,(12-3x^2)\,dx = \pi\int_0^{12}\left[\sqrt{\frac{12-y}{3}}\right]^2 dy$$

b)

$$V = \pi\int_0^2 \left[(12-3x^2+3)^2 - 3^2\right]dx = 2\pi\int_0^{12}(y+3)\sqrt{\frac{12-y}{3}}\,dy$$

5.

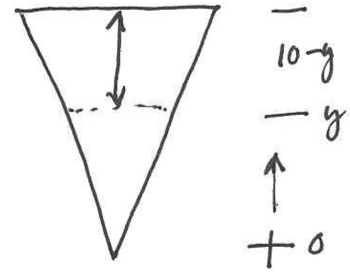
$$S = \int_0^{\frac{\pi}{2}} \sqrt{1 + (x\cos 2x\, 2 + \sin 2x)^2}\,dx$$

6.

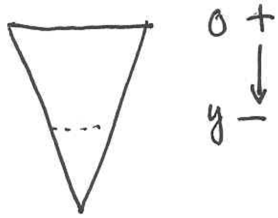
$$L = \int_0^{\pi/2} 2\pi\,(x\sin 2x + 1)\sqrt{1 + (x\cos 2x\, 2 + \sin 2x)^2}\,dx$$

7.

$$F = \int_0^{10} 62.4\,(10-y)\,\tfrac{4}{5}y\,dy$$



$l(y) = \frac{4}{5}y$



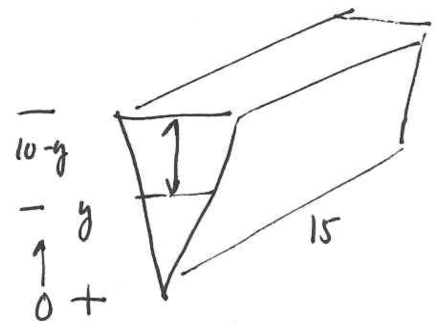
$l(y) = 8 - \frac{4}{5}y$

$$= \int_0^{10} 62.4\,y\left(8-\tfrac{4}{5}y\right)dy$$

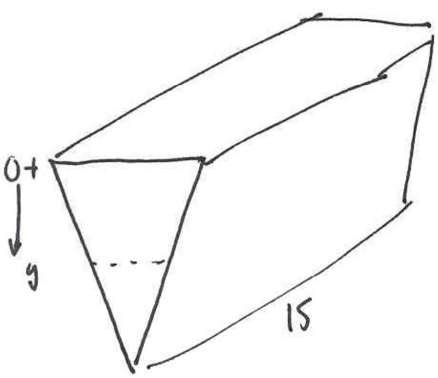
$$= 62.4\left(\tfrac{400}{3}\right) = 8320$$

8.

$$W = \int_0^{10} 62.4\,(10-y)\,15\,\tfrac{4}{5}y\,dy$$



$l(y) = \frac{4}{5}y$



$l(y) = 8 - \frac{4}{5}y$

$$= \int_0^{10} 62.4\,y\,15\left(8-\tfrac{4}{5}y\right)dy$$

$$= 62.4\,(15)\,\tfrac{400}{3} = 124{,}800$$