1. Q) Surface area of rvolution:

$y = \sqrt{6-x}, 4 \leq x \leq 6$

A)

$$S = \int_a^b 2\pi f(x)\sqrt{1+[f'(x)^2]}dx$$
$$f = (6-x)^{1/2}$$
$$f' = -\frac{1}{2\sqrt{6-x}}$$
$$S = \int_4^6 2\pi(6-x)^{1/2}\sqrt{1+(-\frac{1}{2\sqrt{6-x}})^2}dx$$
$$= 2\pi\int_4^6 (6-x)^{1/2}\sqrt{1+\frac{1}{4(6-x)}}dx$$
$$= 2\pi\int_4^6 (6-x)^{1/2}\sqrt{\frac{25-4x}{4(6-x)}}dx$$
$$= \pi\int_4^6 \sqrt{25-4x}dx$$

Let $I = \int \sqrt{25-4x}dx$

$$= \frac{-1}{4}\int \sqrt{u}du \qquad \text{(for } u = 25-4x \text{ and } du = -4dx\text{)}$$
$$= \frac{-1}{6}u^{3/2}$$
$$= \frac{-1}{6}(25-4x)^{3/2}$$
$$S = \frac{-\pi}{6}\left[(25-4x)^{3/2}\right]_4^6$$
$$= \frac{-\pi}{6}\left[(25-24)^{3/2}-(25-16)^{3/2}\right]$$
$$= \frac{-\pi}{6}\left[1-(9)^{3/2}\right]$$
$$= \frac{\pi}{6}[27-1]$$
$$= \boxed{\frac{13\pi}{3}}$$