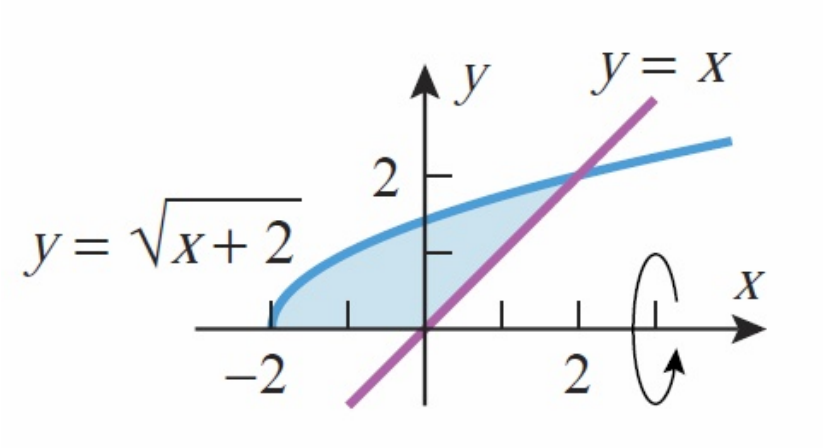
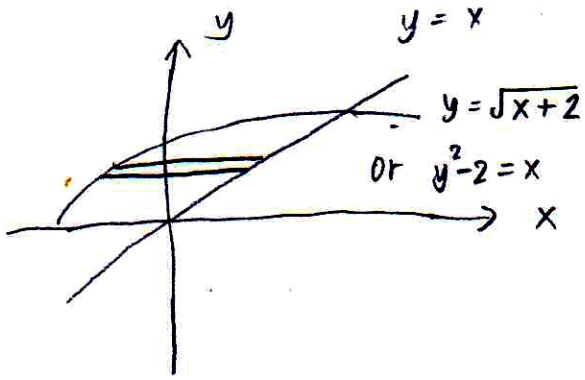
Homework Due Monday, Novemver 10, 2014. **Late homework will NOT be accepted.**

1. Use the shell method to find the volume of the solid of revolution below.



2. Find the length of the curve $y = \frac{2\sqrt{2}}{3}x^{3/2} - 1, \qquad 0 \leq x \leq 1.$

(1)



$$\text{Volume} = \int_0^2 2\pi y\left(y-(y^2-2)\right)dy$$

$$= 2\pi\int_0^2 y^2 - y^3 + 2y\,dy$$

$$= 2\pi\left[\tfrac{1}{3}y^3 - \tfrac{1}{4}y^4 + y^2\,\Big|_0^2\right] = 2\pi\left[\tfrac{8}{3} - 4 + 4\right] = \tfrac{8\pi}{3}$$

(2)

$$y = \frac{2\sqrt{2}}{3}x^{3/2} - 1$$

$$\frac{dy}{dx} = \sqrt{2}\,x^{\frac{1}{2}}$$

$$1 + \left(\frac{dy}{dx}\right)^2 = 1 + 2x$$

$$L = \int_0^1 \sqrt{1+\left(\frac{dy}{dx}\right)^2}\,dx = \int_0^1 \sqrt{1+2x}\,dx$$

let $u = 1+2x$

$\frac{du}{dx} = 2$

$\frac{1}{2}du = dx$

When $x = 0,\ u = 1$

$x = 1,\ u = 1+2 = 3$

$$= \int_1^3 \sqrt{u}\,\tfrac{1}{2}\,du$$

$$= \tfrac{1}{2}\int_1^3 u^{\frac{1}{2}}\,du$$

$$= \tfrac{1}{2}\cdot\tfrac{2}{3}u^{3/2}\,\Big|_1^3$$

$$= \tfrac{1}{3}u^{3/2}\,\Big|_1^3$$

$$= \tfrac{1}{3}\left[3^{3/2} - 1^{3/2}\right]$$

$$= \tfrac{1}{3}\left[3\sqrt{3} - 1\right]$$

$$= \sqrt{3} - \tfrac{1}{3}$$