

$$h = 2x\sqrt{r^2 - x^2} + r^2 - x^2$$

$$\frac{\partial h}{\partial x} = 2\sqrt{r^2 - x^2} - x(r^2 - x^2)^{-\frac{1}{2}}(2x) - 2x \Rightarrow$$

$$\sqrt{r^2 - x^2} - \frac{x^2}{\sqrt{r^2 - x^2}} - x = 0$$

$$\frac{\sqrt{r^2 - x^2} - \frac{x^2}{\sqrt{r^2 - x^2}}}{\sqrt{r^2 - x^2}} - x = 0$$

$$r^2 - x^2 - x^2 - x\sqrt{r^2 - x^2} = 0$$

$$r^2 - 2x^2 = x\sqrt{r^2 - x^2}$$

$$r^4 - 4r^2x^2 + 4x^4 = r^2x^2 - x^4$$

$$5x^4 - 5r^2x^2 = -r^4$$

$$x^4 - r^2x^2 = -\frac{r^4}{5}$$

$$x^2 = \frac{r^2}{2} \pm \sqrt{\frac{r^4}{4} - \frac{r^4}{5}}$$

$$x^2 = \frac{r^2}{2} \pm \sqrt{\frac{r^4}{20}}$$

$$x^2 = \frac{r^2}{2} \pm \frac{r^2}{2\sqrt{5}}$$

$$x^2 = r^2\left(\frac{1}{2} \pm \frac{1}{2\sqrt{5}}\right)$$

$$x = \pm r\sqrt{\frac{1}{2} \pm \frac{1}{2\sqrt{5}}}$$

$$y^2(x^2 + a^2) = a^2 x^2$$

$$x^2 y^2 - a^2 x^2 = -a^2 y^2$$

$$x^2 = \frac{a^2 y^2}{a^2 - y^2}$$

$$x = \frac{ay}{\sqrt{a^2 - y^2}}$$

$$y^2 = \frac{a^2 x^2}{a^2 + x^2}$$

$$A = \int x \, dy = a \int \frac{y}{\sqrt{a^2 - y^2}} \, dy$$

$$A = \frac{a}{-2} \int (a^2 - y^2)^{-1/2} (-2y \, dy)$$

$$= \frac{a}{-2} (a^2 - y^2)^{1/2} + b$$

$$= -a(a^2 - y^2)^{1/2} + b$$

$$A = 0 \text{ when } y = 0 \therefore b = a^2$$

$$\text{When } y = a$$

$$A = a^2$$

$$2A = 2a^2$$

$$\frac{2k(\frac{3}{2}a)}{1} = \frac{3}{2}a$$