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(a) In ΔABC and ΔACD.

$\angle CAD = \angle BAC$ (common)

$(a+y) = AB$, $\therefore AD = a$ (same ratio, as a is drawn from AB).

AC is (common hence in the same ratio.)

$\therefore$ ABC is similar to Δ ACD (equal included angle and 2 sides in same ratio)

(i) $a^2 = b^2 + c^2 - 2bc\cos A$

let $a = x$ $b = a$ and $c = y$.

~~(iii)~~ $x^2 = a^2 + y^2 - 2ay\cos x$

(iii) $y = a(1 - 2\cos\theta)$

~~sin~~

(iv) $y = ay - a$.

$ay = x^2 - a^2$

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

$y = a(x^2 - a - 1)$

Now $y \leq$

(b) $V = \int_a^b y^2 \, dx$.

V for a ~~cone~~ sphere is $\frac{4}{3}\pi r^3 \div 4$

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

$y^2 = r^2 - x^2$.

$\int^0 (r^2 - x^2)\, dx$

A of total sphere. $r^2 x - \frac{x^3}{3} \div 4$

~~$\frac{r^2 x - x^3}{3}$~~

$\left(\frac{r^2 x}{1} - \frac{x^3}{3}\right) \div 4.$

$\frac{3r^2 x - x^3}{3} \times \frac{1}{4}$

total area for quarter. $\left[\frac{3r^3 x - x^3}{12}\right]_r^0$

~~How for~~

$= -\frac{3r^3 r - r^3}{12}$

$\frac{-3r^4 - r^3}{12}$.

$\frac{\pi r^3}{3}\left(2 - \frac{1}{2} r^2 \theta + \sin^3 \theta\right)$

Area of quarter $= \frac{4}{3}\pi r^3 \div 4$

$= \frac{\pi r^3}{3}$ – area of ΔPOA – area of segment.

$\frac{\pi r^3}{3} - \left(2 - \frac{1}{2} r^2 \sin\theta + \sin^3\theta\right)$

~~$\frac{2 - r^2 \sin\theta}{2}$~~

Additional writing space on back page.

(ii) ①

$l = r\theta$

$V = \frac{4}{3}\pi r^3$

$r = \theta / l$

$\frac{1}{2} = \frac{4}{3}\pi r^3$

$l = 1/2$

$\frac{1}{2} = \frac{1}{2} \times \frac{4}{3}\pi \frac{\theta}{l}$

$\frac{1}{2} = \frac{4}{3}\pi \frac{\theta}{2}$

$\frac{8}{3}\pi\theta = 1/2$

$\theta = 1/2$ $\frac{3}{16}\pi$

② $\underline{1/3}$ $\underline{\theta = \frac{3}{16}\pi}$

You may ask for an extra Writing Booklet if you need more space to answer question 10.