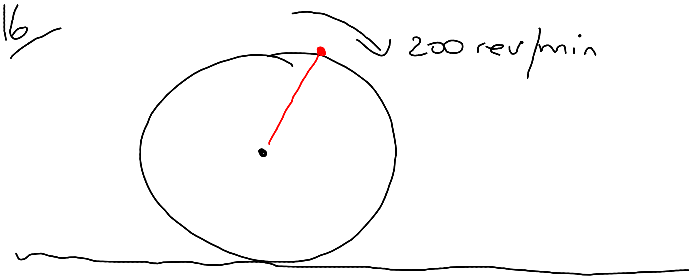
16.



angular velocity

$= 200$ rev/min

$= 400\pi$ rad/min

$= \frac{400\pi}{60}$ rad/s

$= \frac{20\pi}{3}$ rad/s.

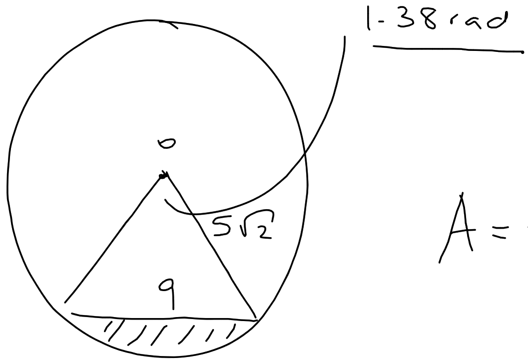
16b)

$$l = r\theta$$

$$= 0\cdot 3 \times \frac{20\pi}{3} \ m/s$$

travels $= 2\pi$ m in one second.

18b)



$$A = \frac{1}{2}r^2\theta - \frac{1}{2}r^2\sin\theta$$

22b)

$$A = \frac{72\theta}{(2+\theta)^2}$$

$$\frac{dA}{d\theta} = \frac{(2+\theta)^2(72) - (72\theta)\left[2(2+\theta)\right]}{(2+\theta)^4}$$

$$= \frac{72(2+\theta) - 144\theta}{(2+\theta)^3}$$

$$= \frac{144 - 72\theta}{(2+\theta)^3}$$

Stationary pts occur when $\frac{dA}{d\theta} = 0$

$$144 - 72\theta = 0$$

$$\theta = 2$$

$\underline{\theta = 2}$

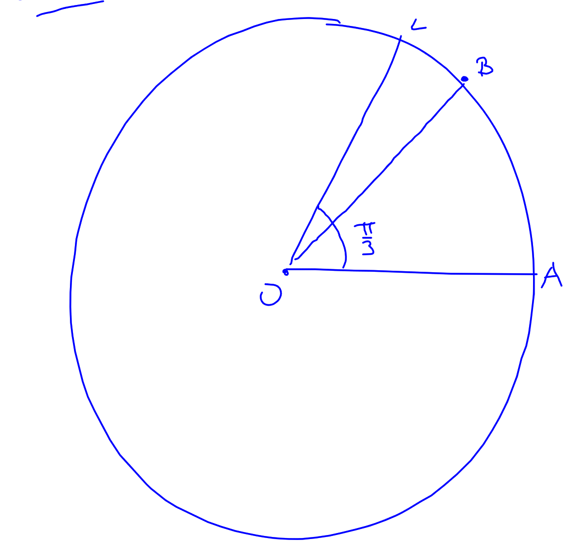
θ	$2^-_{(1)}$	2	$2^+_{(3)}$
$\frac{dA}{d\theta}$	$\frac{72}{3^3} > 0$ /	$\underline{0}$	$\frac{-72}{5^3} < 0$ \

when $\theta = 2$, A is max

$$A = \frac{72(2)}{(2+2)^2}$$

$$= 9 \text{ units}^2$$

246



$l_{AB} = r$

$l_{AC} = r\theta$

$= \frac{\pi}{3} r > r$

$l_{AC} > l_{AB}$

$\frac{\pi}{3} r > r$

$\frac{\pi}{3} > 1$

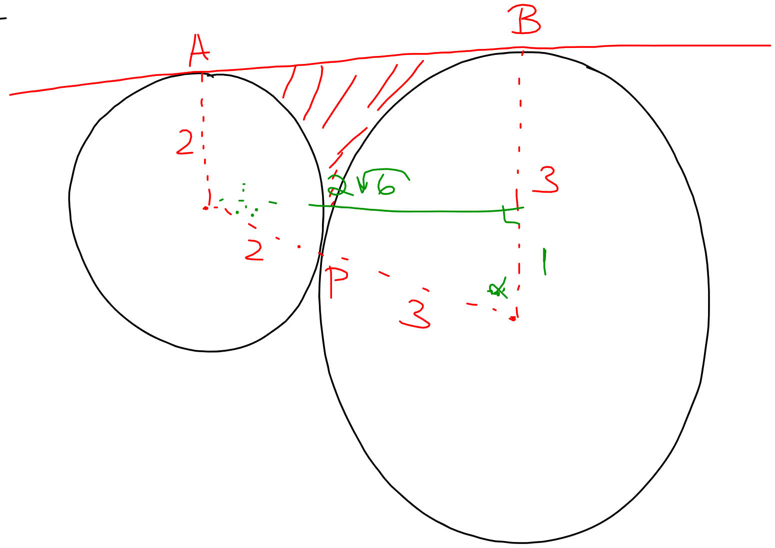
OR

arc AB = chord AC
shortest distance between two points is a straight line

$\therefore$ chord AC < arc AC

thus arc AB < arc AC

25



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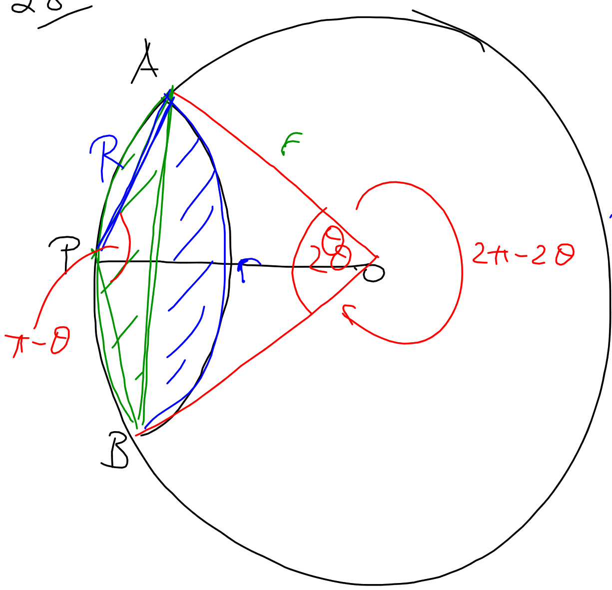


$$\boxed{\sin\theta + (\pi-\theta)\cos\theta = \frac{2\pi}{3}}$$

$$A_{segG} = \frac{1}{2} r^2 (2\theta - \sin 2\theta)$$

$$R^2 = AP^2 = r^2 + r^2 - 2r^2 \cos\theta$$

$$A_{segB} = \frac{1}{2} R^2 \left((\pi-\theta) - \sin(\pi-\theta) \right)$$

$$= \frac{1}{2} R^2 \left((\pi-\theta) - \sin\theta \right)$$

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

$$r^2(\theta-\sin\theta\cos\theta)+\frac{1}{2}R^2(\pi-\theta-\sin\theta)=\frac{1}{3}\pi r^2$$

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

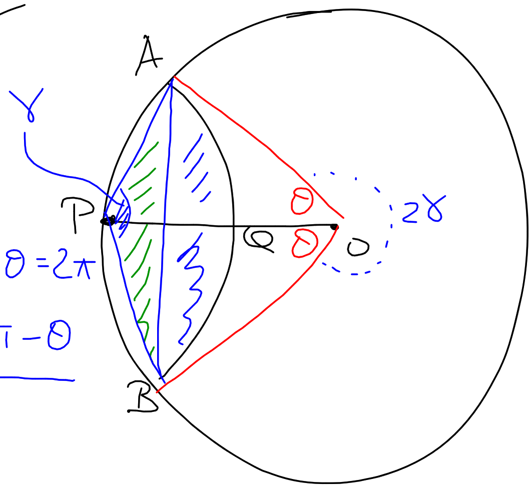
$$\theta-\sin\theta\cos\theta+(\pi-\theta)-\sin\theta-(\pi-\theta)\cos\theta+\sin\theta\cos\theta$$

$$=\frac{1}{3}\pi$$

$$\pi-\sin\theta-(\pi-\theta)\cos\theta=\frac{\pi}{3}$$

$$\underline{\sin\theta+(\pi-\theta)\cos\theta=\frac{2\pi}{3}}$$

28.



$2\gamma + 2\theta = 2\pi$

$\underline{\gamma = \pi - \theta}$

$$\sin\theta + (\pi - \theta)\cos\theta = \frac{2\pi}{3}$$

$$A_G = \frac{1}{2}r^2\left(2\theta - \sin 2\theta\right)$$

$$\frac{AP}{\sin\theta} = \frac{r}{\sin\left(\frac{\pi-\theta}{2}\right)}$$

$$AP = \frac{r\sin\theta}{\sin\left(\frac{\pi}{2} - \frac{\theta}{2}\right)} = \frac{r\sin\theta}{\cos\frac{\theta}{2}}$$

$$A_B = \frac{1}{2} \times \frac{r^2 \sin^2\theta}{\cos^2\frac{\theta}{2}}\left(\pi - \theta - \sin(\pi-\theta)\right)$$

$$= \frac{1}{2} \times \frac{r^2 \sin^2\theta}{\cos^2\frac{\theta}{2}}\left(\pi - \theta - \sin\theta\right)$$

$$A_G + A_B = \frac{1}{3}A_{circle}$$

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

$$2\theta - \sin 2\theta + \frac{\sin^2\theta}{\cos^2\frac{\theta}{2}}(\pi - \theta - \sin\theta) = \frac{2\pi}{3}$$

$$2\theta - 2\sin\theta\cos\theta + \frac{2\sin^2\theta}{1+\cos\theta}(\pi - \theta - \sin\theta) = \frac{2\pi}{3}$$

$$\theta - \sin\theta\cos\theta + \frac{1-\cos^2\theta}{1+\cos\theta}(\pi - \theta - \sin\theta) = \frac{\pi}{3}$$

$$\theta - \sin\theta\cos\theta + (1-\cos\theta)(\pi - \theta - \sin\theta) = \frac{\pi}{3}$$

$$\theta - \sin\theta\cos\theta + \pi - \theta - \sin\theta - (\pi-\theta)\cos\theta + \sin\theta\cos\theta = \frac{\pi}{3}$$

$$\pi - \sin\theta - (\pi-\theta)\cos\theta = \frac{\pi}{3}$$

$$\sin\theta + (\pi-\theta)\cos\theta = \frac{2\pi}{3}$$