8.1 Clean up

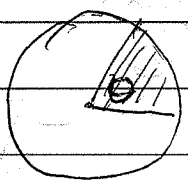
Deg → radian: $\theta \times \frac{\pi \text{ rad}}{180^\circ}$

Radian → degree: $\text{rad} \times \frac{180^\circ}{\pi \text{ rad}}$

(1) Area of a sector: $A_{sector} = \frac{\theta r^2}{2}$

(2) Length of an arc: $s = \theta r$

Where do these come from?

(1) 

$A_{circle} = \pi r^2$ for $\theta = 2\pi$

A_{sector} of $\theta < 2\pi$

Note the proportion $\frac{A_{circle}}{2\pi} = \frac{A_{sector}}{\theta}$

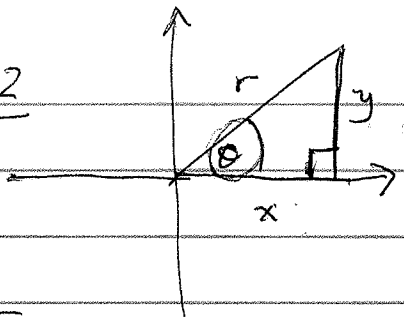
Solve for A_{sector}: $A_{sector} = \frac{\theta \cdot A_{circle}}{2\pi}$

That is, $A_{sector} = \frac{\theta \cdot \pi r^2}{2\pi} = \frac{\theta r^2}{2}$

Alternately, the sector of angle θ is $\frac{\theta}{2\pi}$ the degree measure of the circle. Hence:

$$A_{sector} = \pi r^2 \cdot \frac{\theta}{2\pi} = \boxed{\frac{\theta r^2}{2} = A_{sec}}$$

8.2



$\sin\theta = y/r$

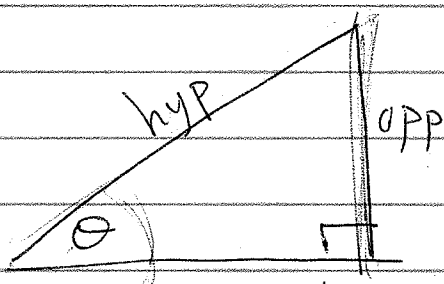
$\cos\theta = x/r$

$\tan\theta = y/x$

Function

$\theta \rightarrow \begin{matrix}\sin\theta \\ \cos\theta \\ \tan\theta\end{matrix}$

$\theta \rightarrow \text{trig}\,\theta$



θ base angle (reference $\measuredangle$)

trig θ = ratio of certain sides for an angle θ; it is unitless

Essential trig "relations":

sine of $\theta \equiv \sin\theta$

cosine of $\theta \equiv \cos\theta$

tangent of $\theta \equiv \tan\theta$

$\sin\theta = \frac{opp}{hyp}$, $\cos\theta = \frac{adj}{hyp}$, $\tan\theta = \frac{opp}{adj}$

SOHCAHTOA

Reciprocal relations:

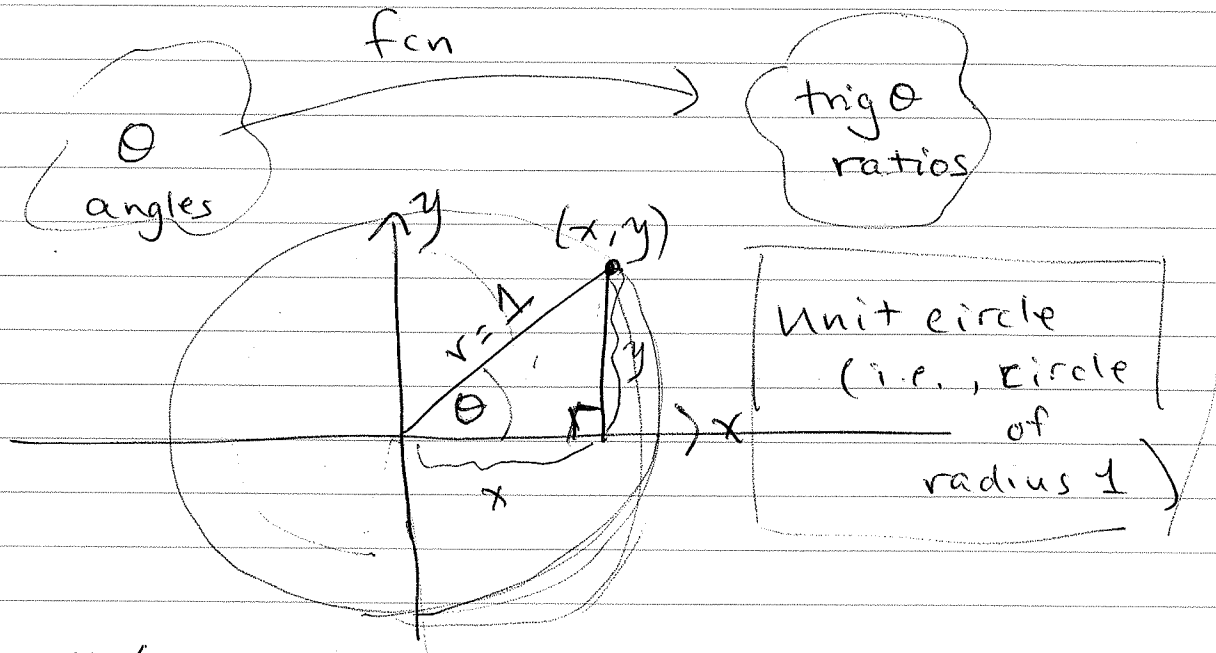
$\frac{1}{\sin\theta} = \text{Cosecant}\,\theta = \csc\theta = \frac{hyp}{opp}$

Reciprocal relations: $\frac{1}{\sin\theta} = \csc\theta = \frac{\text{hyp}}{\text{opp}}$

$\frac{1}{\cos\theta}$ = secant θ = $\sec\theta = \frac{\text{hyp}}{\text{adj}}$

$\frac{1}{\tan\theta}$ = cotangent θ = $\cot\theta = \frac{\text{adj}}{\text{opp}}$

$\tan\theta = \frac{\text{opp}}{\text{adj}} = \frac{\text{opp}/\text{hyp}}{\text{adj}/\text{hyp}} = \frac{\sin\theta}{\cos\theta}$



$\sin\theta = \frac{y}{1}$ $\cos\theta = \frac{x}{1}$ $\tan\theta = \frac{y}{x}$

i.e. $\sin\theta = y$ $\cos\theta = x$

rectangular coord. (x, y) → polar coord. $(\cos x, \sin x)$