The Trigonometric Functions

- **Radians and degrees**
  - $1° = \dfrac{\pi}{180}$ radians   *ie to convert to radians, multiply by $\dfrac{\pi}{180}$*
  - 1 radian $= \dfrac{180}{\pi}$ *ie to convert to degrees, multiply by $\dfrac{180}{\pi}$*

- **Arc length**
  $l = r\theta$

- **Area of a sector**
  $A = \dfrac{1}{2}r^2\theta$

- **Area of Minor Segment Cut off by a Chord**
  $A = \dfrac{1}{2}r^2(\theta - \sin\theta)$

- **Approximations to sinx, cosx, tanx, when x is small**
  - If x is small, $\sin x \approx x \approx \tan x$ and $\cos x \approx 1$
  - If $0 < x < \dfrac{\pi}{2}$, than $\sin x < x < \tan x$
  - $\displaystyle\lim_{x \to 0} \dfrac{\sin x}{x} = 1$ **and** $\displaystyle\lim_{x \to 0} \dfrac{\tan x}{x} = 1$

- **Differentiation of Trigonometric Functions**
  - $y' (\sin x) = \cos x$
  - $y' (\cos x) = \text{-}\sin x$
  - $y' (\tan x) = \sec^2 x$

- **Integration of Trigonometric Functions**

  $\displaystyle\int \cos x \, dx \qquad = \sin x + C$

  $\displaystyle\int \sin ax \, dx \qquad = \text{-}\cos x + C$

  $\displaystyle\int \sec^2 ax \, dx \qquad = \tan x + C$

  $\displaystyle\int \cos ax \, dx \qquad = \dfrac{1}{a}\sin ax$

  $\displaystyle\int \sin ax \, dx \qquad = \text{-}\dfrac{1}{a}\cos ax$

  $\displaystyle\int \sec^2 ax \, dx \qquad = \dfrac{1}{a}\tan ax$

  * Note: When Integrating trigonometric functions where the angle is in degrees, you must change to radians first (ie. multiply by $\dfrac{\pi}{180}$)

- **Integration of $\sin^2 x$ and $\cos^2 x$**
  - $\int \sin^2 x \, dx = \tfrac{1}{2}x - \tfrac{1}{4}\sin 2x + C$
  - $\int \cos^2 x \, dx = \tfrac{1}{2}x + \tfrac{1}{4}\sin 2x + C$