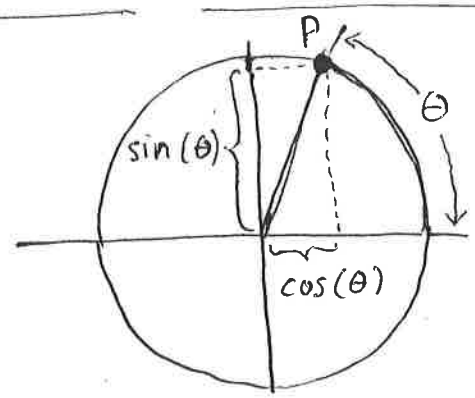
Section 1.3 Review of Trig Functions (Continued)



Recall:

$\cos(\theta) = x$-coordinate of P

$\sin(\theta) = y$-coordinate of P

Notation

- OK to write $\cos\theta$ for $\cos(\theta)$. It's like writing fx for $f(x)$

  Maybe not the best idea, but it's very standard. Use parentheses to avoid ambiguity.

- $\sin^2\theta$ means $(\sin(\theta))^2$, etc.

Picture gives following Identies (True for any θ)

- $\sin^2\theta + \cos^2\theta = 1$
- $\sin(-\theta) = -\sin(\theta)$
- $\cos(-\theta) = \cos(\theta)$
- $\sin(\theta + 2\pi k) = \sin(\theta)$
- $\cos(\theta + 2\pi k) = \cos(\theta)$

  for $k = 0, \pm 1, \pm 2, \ldots$

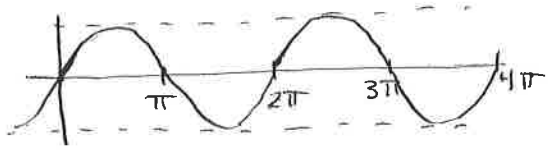
More notation

Independent variable (of course) can be something besides θ.

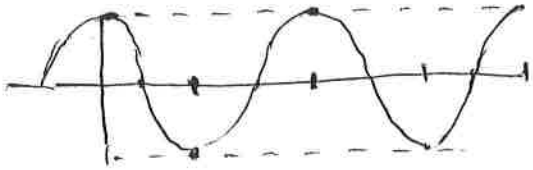
$\cos(\theta)$ $\quad \cos(t)$ $\quad \cos(x)$, $\quad \cos\left(\frac{x^3+1}{1+x^2}\right)$, etc.

Six Trig Functions

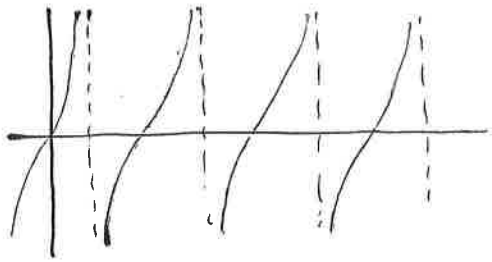
$y = \sin(x)$



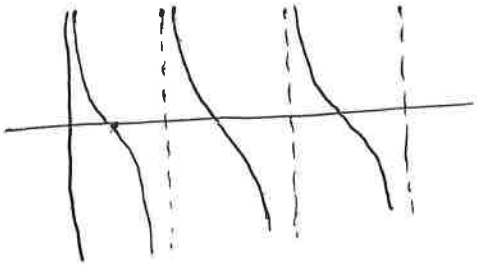
$y = \cos(x)$



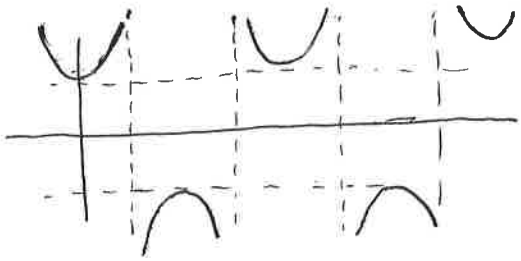
$y = \tan(x) = \dfrac{\sin(x)}{\cos(x)}$



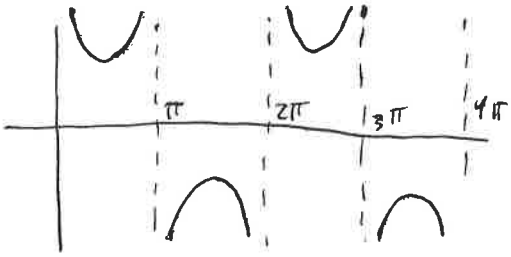
$y = \cot(x) = \dfrac{\cos(x)}{\sin(x)}$



$y = \sec(x) = \dfrac{1}{\cos(x)}$



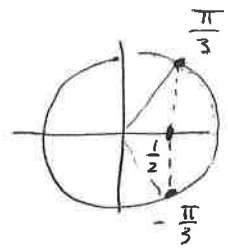
$y = \csc(x) = \dfrac{1}{\sin(x)}$



No need to write this it's in your text.

Here for reference only.

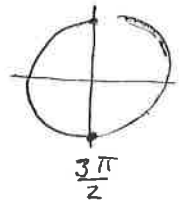
Solving Trig Equations



Ex Find all solutions: $\cos(x) = \frac{1}{2}$

Solutions: $\left.\begin{array}{l} x = \frac{\pi}{3} + 2\pi k \\ x = -\frac{\pi}{3} + 2\pi k \end{array}\right\}$ $k = 0, \pm 1, \pm 2, \ldots$

Ex Find the domain: $f(x) = \dfrac{1}{1+\sin(x)}$



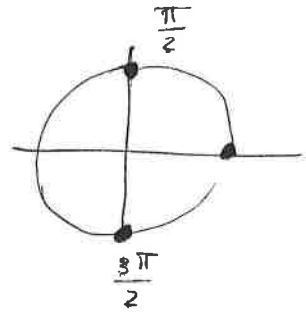
Domain: $\left\{ x \mid x \in \mathbb{R},\ x \neq \frac{3\pi}{2} + 2k\pi \right\}$ (where $k = 0, \pm 1, \pm 2, \ldots$)

Ex Solve: $\cos^2 x - \cos x = 0$

$\cos(x)\left(\cos(x) - 1\right) = 0$

$\cos(x) = 0$ $\qquad$ $\cos(x) = 1$

$x = \frac{\pi}{2} + k\pi$ $\qquad$ $x = 2k\pi$



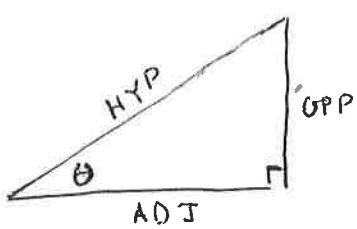
$$\boxed{\text{Solutions: } \left.\begin{array}{l} x = \frac{\pi}{2} + k\pi \\ x = 2\pi k \end{array}\right\} \quad k = 0, \pm 1, \pm 2, \pm 3 \ldots}$$

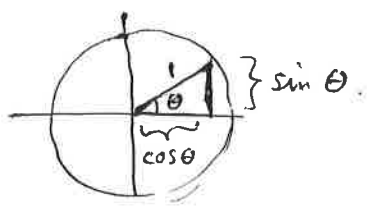
More Identities

$$\left.\begin{aligned} \cos(\alpha+\beta) &= \cos\alpha\cos\beta - \sin\alpha\sin\beta \\ \sin(\alpha+\beta) &= \cos\alpha\sin\beta + \sin\alpha\cos\beta \end{aligned}\right\} \text{Addition Formulas}$$

$$\left.\begin{aligned} \cos(2\alpha) &= \cos^2\alpha - \sin^2\alpha \\ \sin(2\alpha) &= 2\cos\alpha\sin\alpha \end{aligned}\right\} \text{Double Angle Formulas.}$$

Solving Triangles (finding lengths of missing sides, etc.)





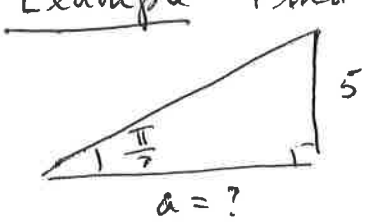
By similar Δ's

$$\frac{\sin\theta}{1} = \frac{OPP}{HYP} \rightsquigarrow \boxed{\sin\theta = \frac{OPP}{HYP}}$$

$$\frac{\cos\theta}{1} = \frac{ADJ}{HYP} \rightsquigarrow \boxed{\cos\theta = \frac{ADJ}{HYP}}$$

$$\frac{\sin\theta}{\cos(\theta)} = \frac{OPP}{ADJ} \rightsquigarrow \boxed{\tan\theta = \frac{OPP}{ADJ}}$$

Example Find the missing side a.



$$\frac{5}{a} = \frac{OPP}{HYP} = \tan\left(\frac{\pi}{2}\right)$$

$$a = \frac{5}{\tan(\pi/2)} \approx 10.3826..$$