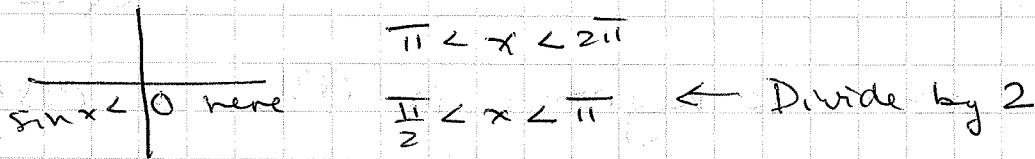


Sec 8.8

#17a) Given  $\sin x < 0$  and  $0 \leq x < 2\pi$

Can we tell the sign of  $\sin\left(\frac{x}{2}\right)$ ?

Consider that  $x$  must be in  $\text{QIII}$  or  $\text{IV}$  since  $\sin x < 0$ . This narrows it down:



So  $\sin\left(\frac{x}{2}\right)$  is positive, since this is  $\text{QII}$ .

What about the sign of  $\cos\left(\frac{x}{2}\right)$ ?

Since cosine is negative in  $\text{QII}$ , we know the sign.

b) Given  $\cos x < 0$ , we're in  $\text{QII}$  or  $\text{III}$

$$\frac{\pi}{2} < x < \frac{3\pi}{2}$$

Is  $\cos\left(\frac{x}{2}\right)$  positive or negative?

Again, divide dom by 2:  $\frac{\pi/2}{2} < \frac{x}{2} < \frac{3\pi/2}{2}$

giving  $\frac{\pi}{4} < \frac{x}{2} < \frac{3\pi}{4}$ ,  $\text{QI}$  or  $\text{II}$ , so we can't say for certain sign  $\cos\left(\frac{x}{2}\right)$

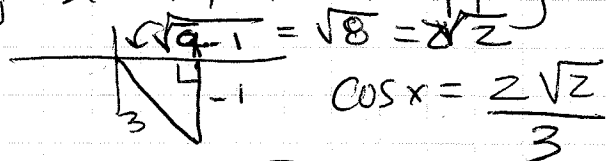
However,  $\sin\left(\frac{x}{2}\right)$  is positive in both  $\text{QI}$  &  $\text{II}$ .

#18.  $\sin x = -\frac{1}{3}$ , given in  $\text{QIV}$

Find  $\cos\left(\frac{x}{2}\right)$ .

Draw diagram, find missing side, then apply  $\frac{1}{2}$  angle formula.

$$\cos\left(\frac{x}{2}\right) = \pm \sqrt{\frac{1 + \cos x}{2}} = \pm \sqrt{\frac{1 + \frac{2\sqrt{2}}{3}}{2}}$$



$$\cos x = \frac{2\sqrt{2}}{3}$$

$$\pm \sqrt{\frac{3+2\sqrt{2}}{6}}$$

To determine whether  
it's + or -, look  
for which Q  $\left(\frac{x}{2}\right)$  is in.

Given  $\frac{3\pi}{2} < x < 2\pi$   $\xrightarrow{\div 2}$   $\frac{3\pi}{4} < \frac{x}{2} < \pi$   
QIV QII  
to start

The cosine is negative in QII, so  $\cos\left(\frac{x}{2}\right) = -\sqrt{\frac{3+2\sqrt{2}}{6}}$