

# Math 112

Q's

Suppose that  $\sin(\theta) = 6/10$  and  $\theta$  is in the second quadrant. Use trigonometric identities to find the following quantities exactly.

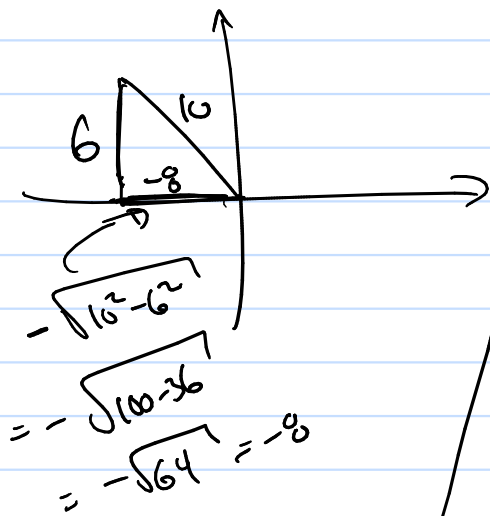
(a)  $\cos(\theta) = -\frac{8}{10} = -\frac{4}{5}$

(b)  $\sin(2\theta) = 2 \sin \theta \cos \theta = 2 \left(\frac{6}{10}\right) \left(-\frac{4}{5}\right) = -\frac{24}{25}$

(c)  $\cos(2\theta) = \cos^2 \theta - \sin^2 \theta = \left(-\frac{4}{5}\right)^2 - \left(\frac{6}{10}\right)^2 =$

(d)  $\tan(2\theta) = \frac{\sin(2\theta)}{\cos(2\theta)} =$

$$\sin \theta = \frac{6}{10} = \frac{\text{opp}}{\text{hyp}}$$



Verification

$$\tan\left(\theta + \frac{\pi}{2}\right) = \frac{\sin\left(\theta + \frac{\pi}{2}\right)}{\cos\left(\theta + \frac{\pi}{2}\right)}$$

$$\sin\left(\theta + \frac{\pi}{2}\right) = \sin(\theta) \cdot 0 + \cos(\theta) \cdot 1 = \cos \theta$$

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

$$= -\sin \theta$$

$$\text{So } \tan\left(\theta + \frac{\pi}{2}\right) = \frac{\cos \theta}{-\sin \theta} = -\cot \theta$$

$$\text{So far above } \tan\left(\theta + \frac{\pi}{2}\right) = -\frac{-8}{6} = \frac{8}{6} = \boxed{\frac{4}{3}}$$

# How to "do" Math?

From Examples & Textbook

(5 min)

① Read the Section

② choose 2 or 3 (or more) examples to copy.

Also Make multiple sheets of all identities

③ Copy and explain to yourself others what every symbol, line, equality means.

④ write out the problem on a blank sheet, do it, and check.

⑤ try similar exercises.

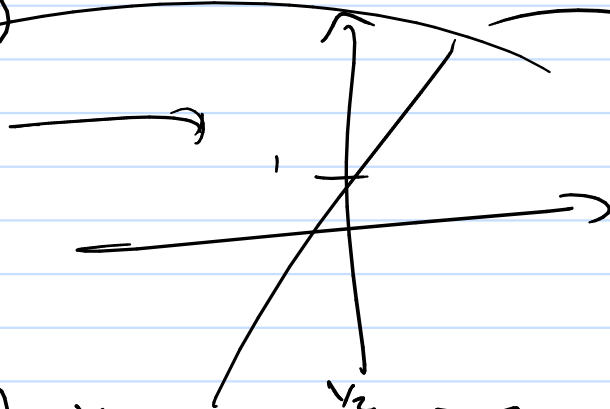
16.5 graphs

$$f(x) = 3x + 1$$

$$x^2, x^3, |x|$$

$$\frac{1}{x}, b^x, \log_b x$$

$$x^{1/2} = \sqrt{x}$$



Known?

trig?

$$f(\theta) = \sin \theta$$

$$f(\theta) = \cos \theta$$

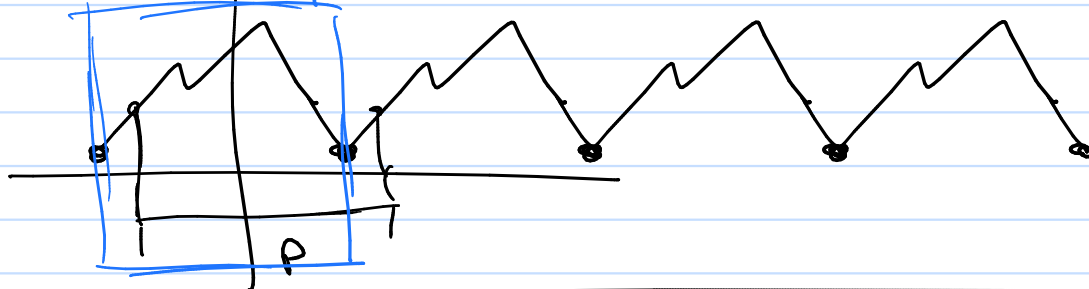
Def:

a periodic function is one where

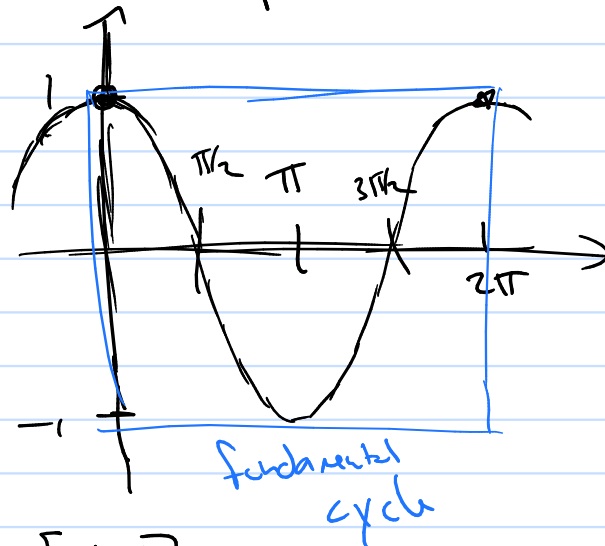
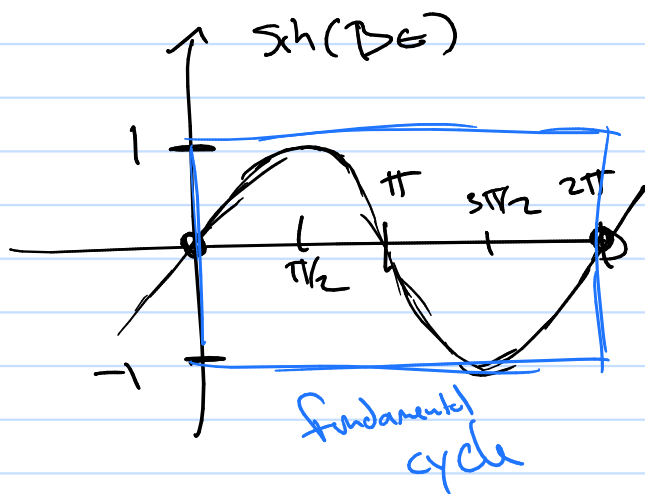
$$f(x + p) = f(x)$$

↑  
period of  $f$

fundamental cycle



both  $\sin \theta$ ,  $\cos \theta$  are periodic and period =  $2\pi$



① Domain:  $(-\infty, \infty)$       Range:  $[-1, 1]$

② it is continuous, smooth

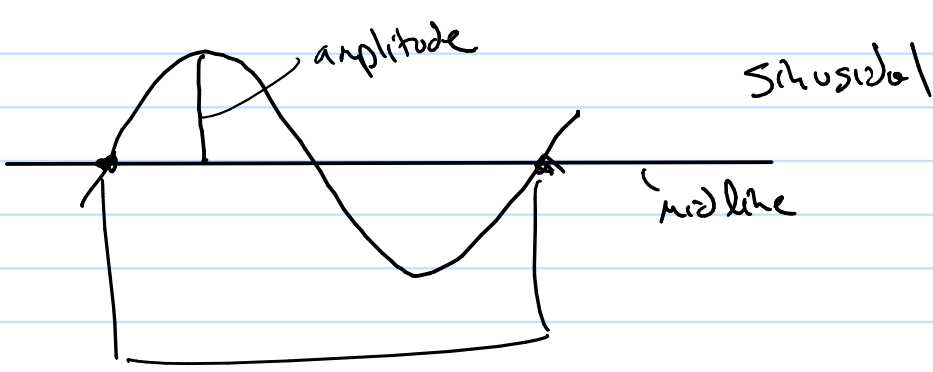
③ period =  $2\pi$

④  $\cos(\theta)$  is even       $\sin(\theta)$  is odd

b/c  $\cos(\pi/2 - \theta) = \sin \theta$

$$\sin(\pi/2 - \theta) = \cos \theta$$





Sinusoidal

$$A \sin(\omega t + \phi) + B$$

↑  
frequency period

← phase

$$A \cos(\omega t + \phi) + B$$

A, ω, φ, B are constants

(ex)  $f(t) = 3 \sin(\pi t + 4) + 2$

amplitude = |A|

period =  $\frac{2\pi}{\omega}$

vertical shift = B

horz. shift  
phase shift =  $-\frac{\phi}{\omega}$