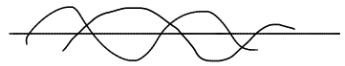


GRAPHS For #6

frequency

$A\sin(k(x-p))+C$

Amp $= |A| = \frac{1}{2}$ height of wave

a) $y = \cos(x)$

b) $y = 2\sin(\frac{5}{6}x)$

high amp, low freq

c) $y = -\cos(x - \frac{5\pi}{4}) + 1$

bigger Amp. $\longleftrightarrow$ C

d) $y = \frac{1}{2}\sin(2x) + \frac{1}{2}$

e) $y = \frac{2}{3}\cos(x + \frac{3\pi}{4}) - 1$

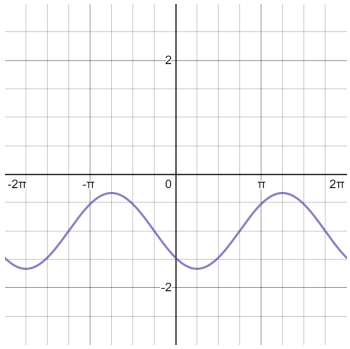
A

f) $y = -\frac{1}{3}\sin(3(x + \frac{\pi}{3}))$

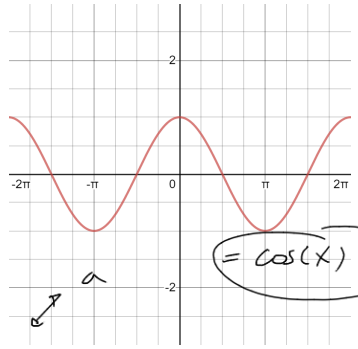
low amp

high freq

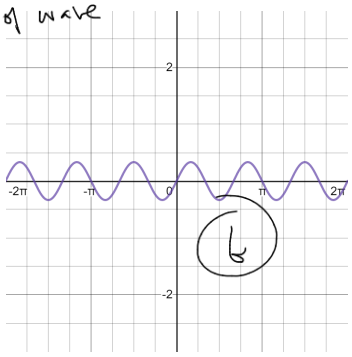
e $\longrightarrow$ A)



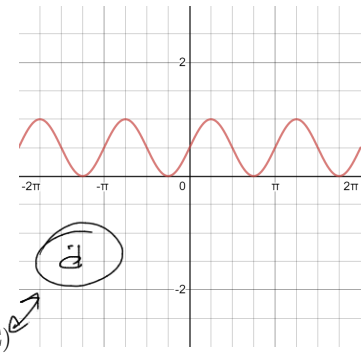
D)



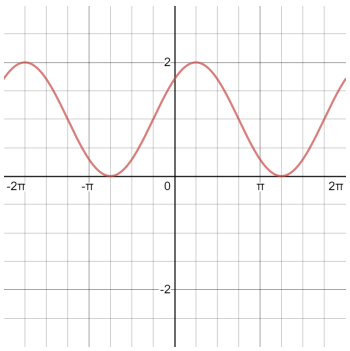
B)



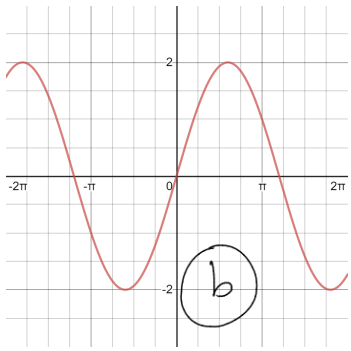
E)



c $\longleftrightarrow$ C)



F)



M. Week 11 ——————

Set 7.12

$k=0$ $\quad k=1$ $\quad k=2$

$x=0$, $\quad x = A\pi = \pi/3$ $\quad x = \frac{1}{3}\cdot(2)\pi = \frac{2\pi}{3}$

Find all solutions of the equation $\tan^5 x - 9\tan x = 0$.
The answer has the form $x = Ak\pi$ where $k = 0, \pm1, \pm2, \pm3, \ldots$ ranges over the integers and the constant $A =$ _____ .

1st Recall: $x^5 - 9x = 0$

$\hookrightarrow$ $x(x^4 - 9) = 0$

$\boxed{x = 0}$

$x^4 - 9 = 0 \rightsquigarrow (x^2 - 3)(x^2 + 3) = 0$

diff of squares

$x^2 = 3$ $\quad \boxed{x = \pm\sqrt{3}}$

$x^2 = -3$

$x = \pm\sqrt{-3}$ no real sol's.

In given prob. tan x plays role of x ——————

$\tan x(\tan^4 x - 9) = 0$

$\tan x = 0$ $\quad \tan^4 x - 9 = 0$

$(\tan^2 x - 3)(\tan^2 x + 3)$

$\tan^2 x = 3$

$\tan x = \pm\sqrt{3}$

$\tan x = \pm\sqrt{-3}$ (DNE)

1st sol'n $\quad x = \tan^{-1}(0) = 0$

where (angle) is $\tan x = 0$

angle 0!

$x = \tan^{-1}(\sqrt{3}) = \frac{\pi}{3}$

or $x = \tan^{-1}(-\sqrt{3}) = \frac{2\pi}{3}$

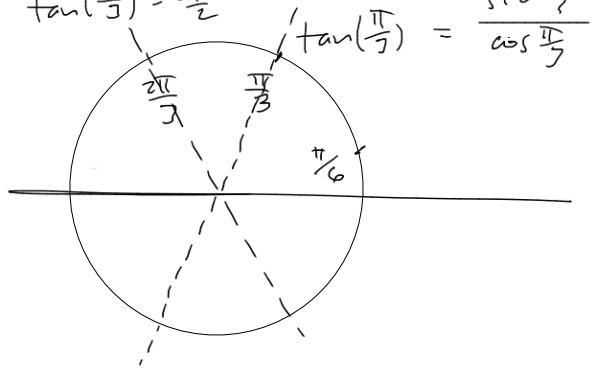
2nd $\quad x = 0 + k(\pi) = k\pi \quad (k \in \mathbb{Z})$

period

k is any integer.

$\tan\left(\frac{2\pi}{3}\right) = \frac{\frac{\sqrt{3}}{2}}{-\frac{1}{2}} = -\sqrt{3}$

$\tan\left(\frac{\pi}{3}\right) = \frac{\sin\frac{\pi}{3}}{\cos\frac{\pi}{3}} = \frac{\frac{\sqrt{3}}{2}}{\frac{1}{2}} = \sqrt{3}$ $\quad$ So ...



WW #7.10

$$3\sin^2 x - 7\sin x + 2 = 0$$

<u>Think:</u> See 3 terms, highest degree is 2

$$3w^2 - 7w + 2 = 0$$

$$3w^2 - 6w - w + 2 = 0$$

$$3w(w-2) - (w-2) = 0$$

$$(3w-1)(w-2) = 0$$

$$3w = 1 \quad \text{or} \quad w = 2$$

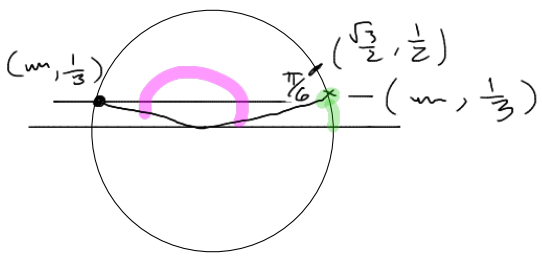
$$w = \tfrac{1}{3} \qquad w = 2$$

Our problem has $\sin x$ in place of w

$\sin x = \frac{1}{3}$ $\qquad$ $\sin x = 2$

$\downarrow$

<u>No sols</u>



$$\boxed{\begin{aligned} x &= \sin^{-1}\left(\tfrac{1}{3}\right) \\ x &= \pi - \sin^{-1}\left(\tfrac{1}{3}\right) \end{aligned}}$$

In a circle of radius 4 miles, the length of the arc that subtends a central angle of 1 radians is 1·4 miles.

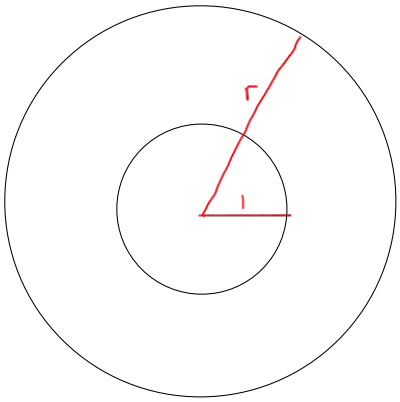
Key: Arc length:

$S = \theta \cdot r$

radius

radians

length along circle of an arc subtended by angle θ



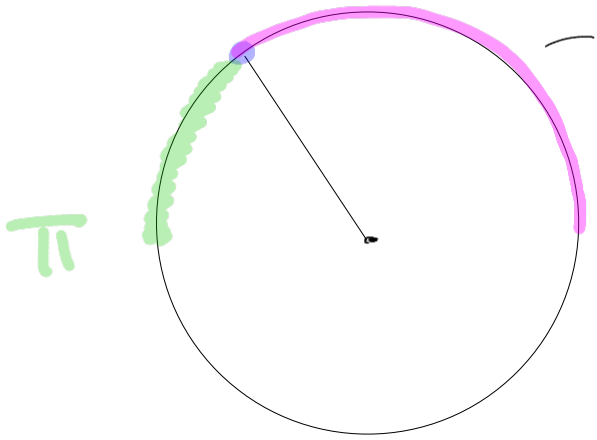
Circumference of a circle —

$C = 2\pi r$

[on unit circle

$C = 2\pi$]

$\theta = 2$



— shown is 2 radians

ref angle $\bar{\theta}$ is green

(dist. from T.P. to horizontal

$$\bar{\theta} = \pi - \theta = \pi - 2$$