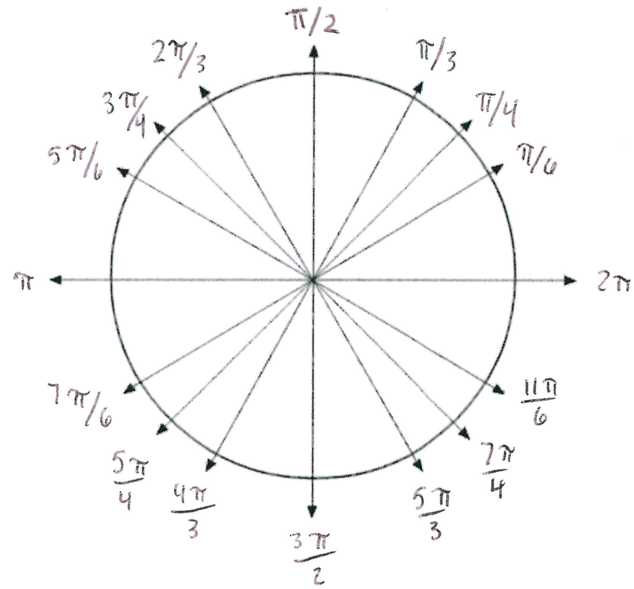
Sadie & Cap

Trigonometric Functions Practice Test

Part A: Knowledge and Understanding:

1. Label the unit circle.

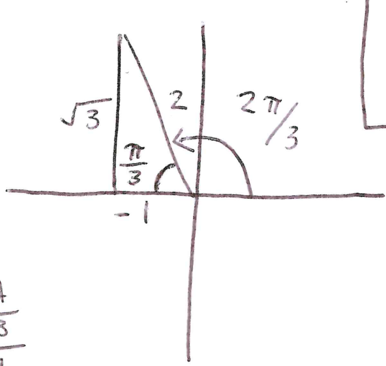


2. Change from degrees to radians: 170° = $17\pi/18$

3. Change from radians to degrees: $7\pi/8$ = $157.5°$

4. For each trigonometric ratio use a sketch to determine in which quadrant the terminal arm of the principle angle lies, the value of the related acute angle and the sign of the ratio.

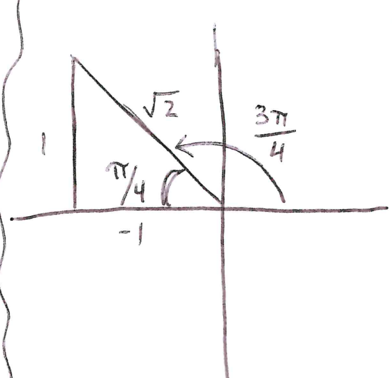
a) tan $2\pi/3$



quadrant = II
RAA = $\pi/3$
sign = −ve

TOA
$= \frac{\sqrt{3}}{-1}$
↳ −ve

b) csc $3\pi/4$



$H/O \rightarrow \sqrt{2}/1$

$\csc = \frac{1}{\sin}$

$\csc(3\pi/4) = \frac{1}{\sin(3\pi/4)}$

$\csc(3\pi/4) = \sqrt{2}$

quadrant = II
RAA = $\pi/4$
sign = +ve

5. For each of the following values of cosθ, determine the measure of θ

if π < θ < 2π. Include a sketch for each solution.

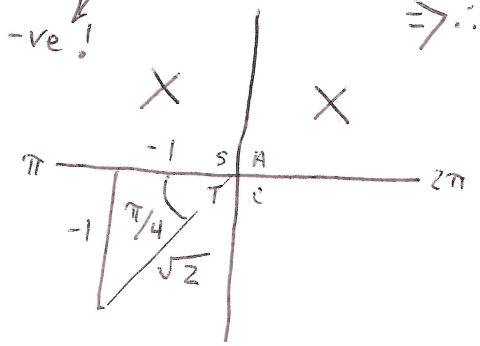
a) -√2 / 2

-ve !

$\pi + \pi/4$

$\cos\theta = \cos \frac{5\pi}{4}$

$\Rightarrow \therefore \frac{5\pi}{4}$

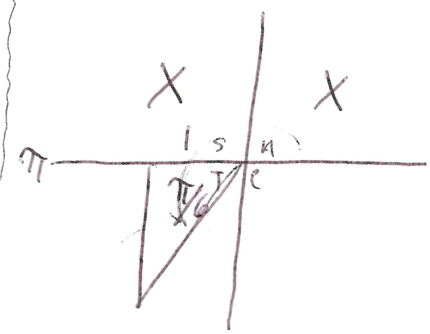


b) - √3 / 2

$\pi + \pi/6$

$\cos\theta = \cos \frac{2\pi}{6}$

$= 7\pi/6$



6. The 360 restaurant in the CN tower takes 72 minutes complete one full rotation.

A person eating at the restaurant rotated through and angle of 23π/12 by the time they

finished their meal. How long were they eating for?

$\frac{72\text{min}}{360°} \rightarrow \frac{72\text{min}}{2\pi}$ } per rotation

$\frac{x}{23\pi/12} \times \frac{72\text{min}}{2\pi}$

$x = \frac{(72)(23\pi/12)}{2\pi}$

$= \frac{(1656\pi/12)}{2\pi}$

$= \frac{138\cancel{\pi}}{2\cancel{\pi}}$

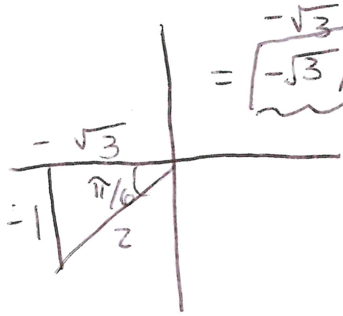
$= 69\text{min}$

$\Rightarrow \therefore$ they were eating for 69 minutes

7. Use special triangles to determine the exact value of each of the following.

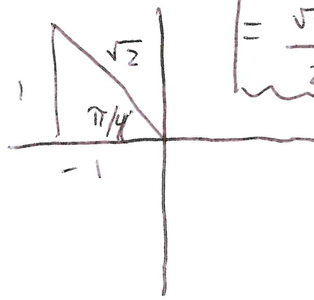
a) tan 7π / 6 $= \frac{-1}{-\sqrt{3}}$

$= \boxed{-\sqrt{3}/3}$



b) sin 3π / 4 $= \frac{1}{\sqrt{2}}$

$= \boxed{\frac{\sqrt{2}}{2}}$



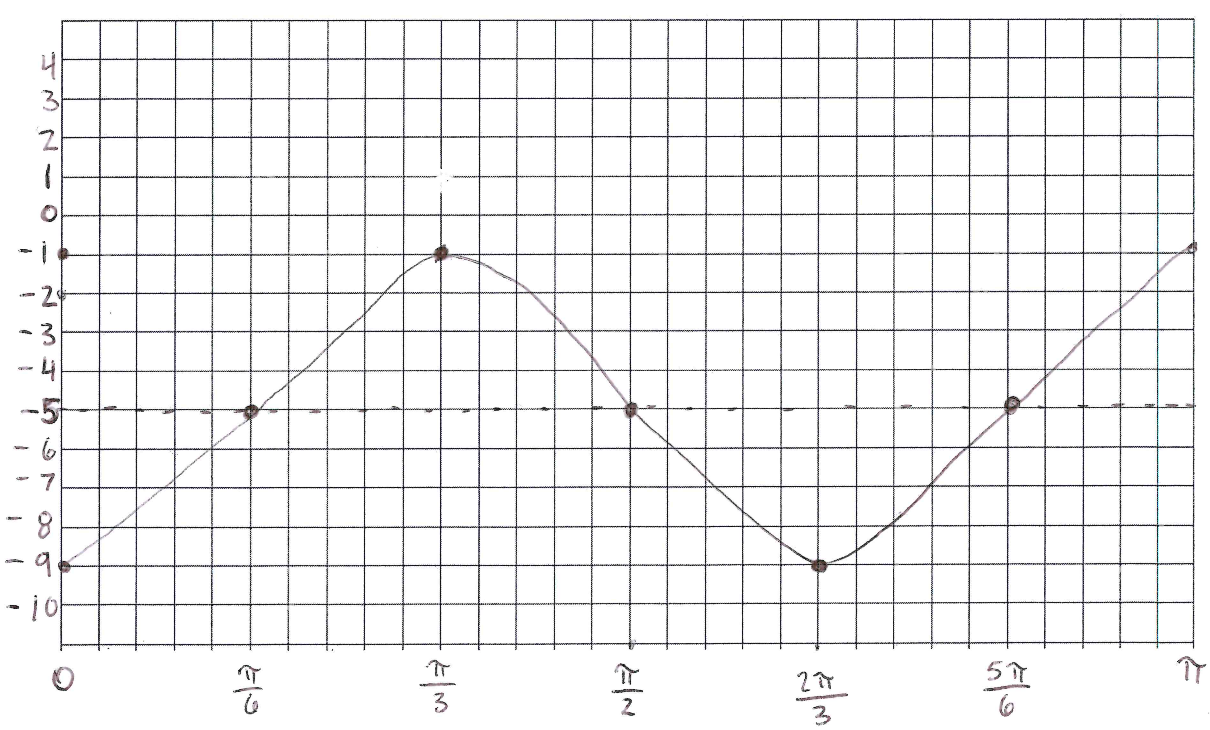
8. a) State the period, amplitude, phase shift and vertical translation for the function

f(x) = 4 sin (3(x + π/2)) -5

Period → $2\pi/K = 2\pi/3$
↳ $2\pi/3$

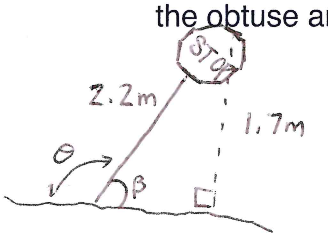
amp → 4
Phase shift → π/2 to the left
vertical translation → down 5 units

b) Graph the function from part a) for the period 0 ≤ x ≤ π



Part B: Application

1. A leaning stop sign, 2.2 m tall, makes an obtuse angle with the ground. If the distance from the top of the stop sign to the ground is 1.7 m, determine the radian measure of the obtuse angle, to the nearest hundredth. Include a sketch in your solution.



$\beta = \sin^{-1}\left(\frac{1.7}{2.2}\right)$

$= 0.883$

$\theta = \pi - 0.883$

$= 2.259$

∴ the radian measure of the obtuse angle is 2.259 radians

2. A person is riding a ferris wheel that is 80.5m tall. At their lowest point on the rotation, where they get on and off of the ferris wheel, they are 1.5m off the ground. Sketch three rotations of the ferris wheel on a graph that represents the height of the person above the ground. Determine the equation of the function that describes this graph.

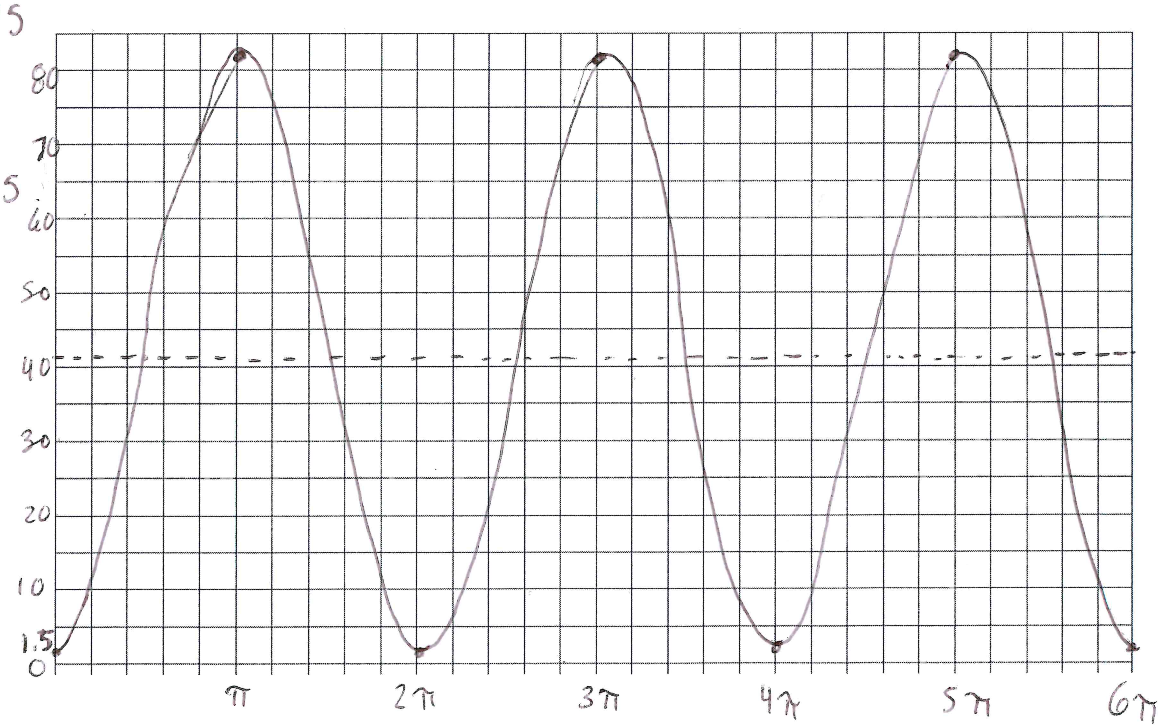
period - 2π

axis - 41.75

min - 1.5

max - 82

amp - 40.25

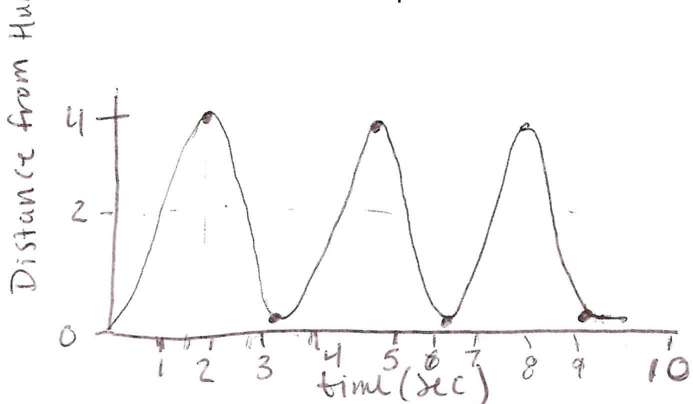


$P(t) = -40.25\cos t + 41.75$

3. Ms. Humphries is pushing Mr.Gilbert on a playground swing. At optimal speed Mr. Gilbert swings back and forth 8 times in 25 seconds. He swings through a total horizontal distance of 4m.

a) Sketch a rough graph of this motion for three cycles, beginning with when Mr.Gilbert is closest to Ms. Humphries.

$\frac{25}{8} = 3.125$ sec per swing cycle



b) Describe the transformations necessary to transform y= sin x into the function you graphed in part a.

a - reflection in the y-axis
- vertical stretch by a factor of 2

K - horozontal stretch by afactor of $16\pi/25$

c - vertical shift up 2 units

d - n/a

c) Write the equation that models this situation.

$G(t) = -2\cos\left(\frac{16\pi}{25}\right) + 2$

K → period is 3.125 sec/swing cycle

→ $\frac{2\pi}{k} = 3.125$

→ $k = \frac{16\pi}{25}$

amp → 2 m

eos → 2 m

→ starts closest to Humphries (0m) so −cos.

4. Caprial jumps on her pogo stick. The function *h(t)= -30cos (π/2 t)+ 30* models the height of the bottom of the pogo stick from the ground, *h* in cm, at *t* seconds.

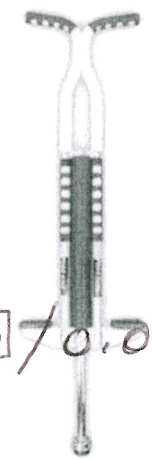
X	Time (s)	0	0.5	1	1.5	2	2.5	3
y	Height (cm)	0	8.787	30	51.213	60	51.213	30

a) Determine the average rate of change in the height of the pogo stick from 0.5 to 2 seconds. $\frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{60 - 8.787}{2 - 0.5}$

$= \frac{51.213}{1.5}$

∴ 34.142 cm/sec is the avg. ROC



b) Estimate the instantaneous rate of change in the height of the pogo stick at *t = 3.*

ROC = h (t + 0.001) − h (t) / 0.001

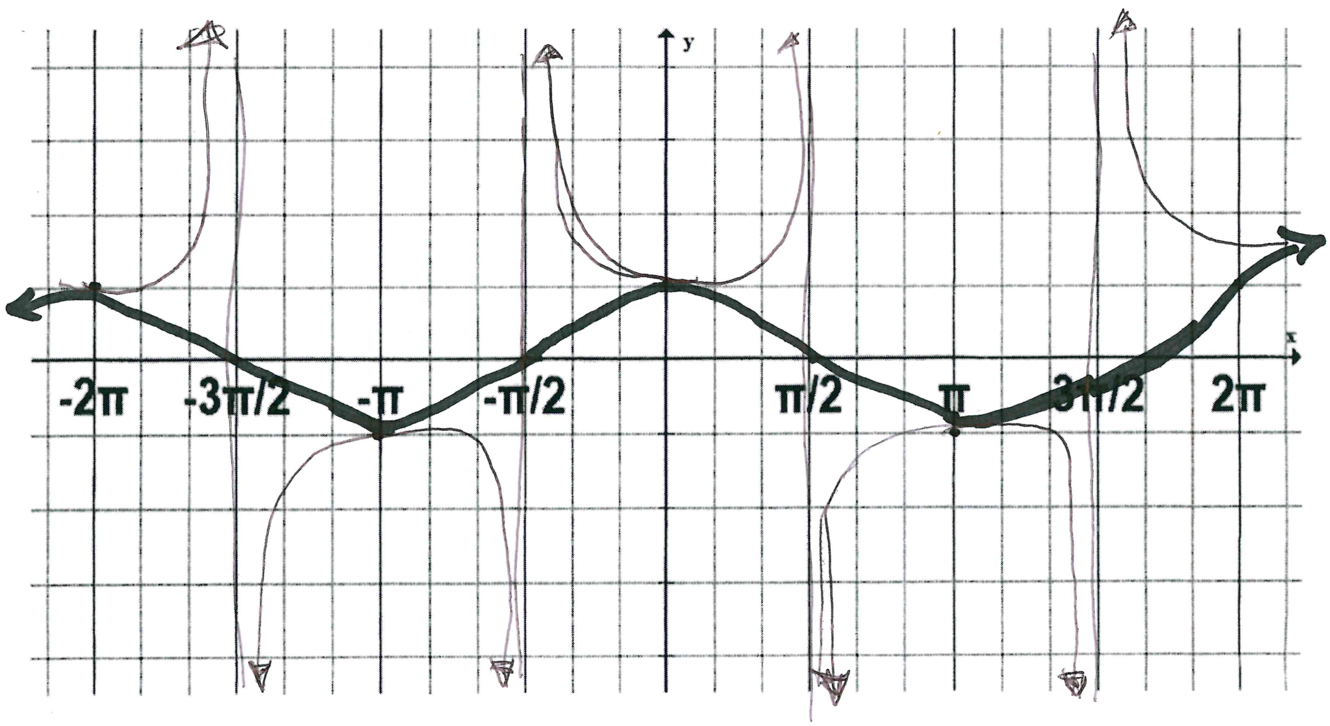
= [-30 cos (π/2 (3.001)) + 30] + [-30 cos (π/2 (3)) + 30] / 0.001

= 0.04712 / 0.001

= -47.12 cm/sec

∴ -47.12 cm/sec is the instantaneous ROC

5. Graph y= cos θ and its reciprocal.

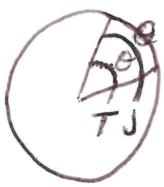


Part C: Thinking/Inquiry/Problem Solving

1. Timmy and Jolene are riding on a merry-go-round. Jolene is close to the edge of the merry-go- round, and Timmy is close to the centre.

a) Is the angular velocity at which Jolene is travelling greater than, less than or equal to the angular velocity at which Timmy is travelling?

They would be the same because they would both travel the same angle



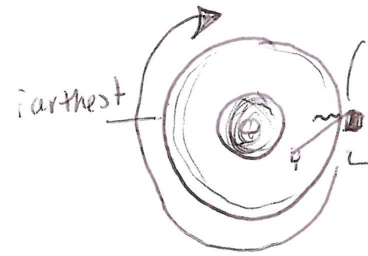
b) Is the velocity at which Jolene is travelling greater than, less than or equal to the velocity at which Timmy is travelling?

Jolene would be traveling @ a greater velocity because she'd travel further in the same amount of time.

c) If the angular velocity of the merry-go-round increased, would the velocity at which Jolene is travelling as a percent of the velocity at which Timmy is travelling increase, decrease or stay the same?

They would still travel @ the same ~~angular~~ velocity because she would always be travelling the same percent faster than him, they both speed up by the same amount.

2. A scratch at the edge of the record can be modelled by a cosine function. A record spins 20 times in 1 minute. At $t = 0$, the scratch is closest to the arm of the record player. Determine whether the instantaneous rate of change in distance from the arm at $t = 13.02$ (seconds) is a negative value, a positive value or zero.



closest @ 0, 3, 6, 9, 12, 15

60/20 ~~turns~~ = 3 sec/turn

→ Farthest @ 1.5, 4.5, 7.5, 10.5, 13.5

13.02 seconds > 12 (when the scratch is closest)

13.02 < 13.5 (when the scratch is furthest)

∴ the scratch is travelling away and the inst. RoC would be "+ve"

Part D: Communication

1. A can of soup falls out of a car and starts to roll down a kilometre long hill. After 200m a piece of gum gets stuck to the can. If Caprial wanted to graph a cosine function to model the hight of the gum off of the pavement, would she graph the distance of the gum off of the pavement as a function of total distance travelled by the can or a function of time the can rolled?

Cap should graph the height of the gum above the ground as a function of the total distance travelled by the gum because the gum would not be travelling @ a constant speed. If Cap graphed the height of the gum above the pavement as a function of time the graph wouldn't be sinusoidal.

2. If you are given an angle θ that lies in the interval θ ∈ [π , 2π] how would you determine the values of the primary trigonometric ratios for this angle?

- Draw the angle and determine the measure of the RAA.
- Use the CAST rule to determine the sign of each of the ratios in the quadrant the angle lies in.
- Use the sign and the value of the ratios of the RAA to determine the values of the primary trig. ratios for the given angle.