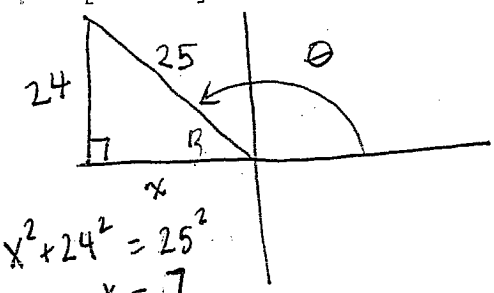
MHF4U – Test: Trigonometric Functions Practice Test

Name: Solutions

Mark: – – –

KU APP TIPS

1. a) Determine the exact values of sec ϑ and tan ϑ (as a fraction), if $\angle\vartheta$ is a quadrant 2 angle and the point $P(x,24)$ is exactly 25 units from the origin and lies on the terminal arm of $\angle\vartheta$. [TIPS / 3]



$x^2+24^2=25^2$

$x=7$

$\sec\theta = \frac{-25}{7}$

$\tan\theta = \frac{-24}{7}$

b) Determine the value of $\angle\vartheta$ in radians rounded to the nearest hundredth. [APP / 2]

Find β

$\beta \doteq 73.74°$

Find θ

$\theta \doteq 106.26°$

$\theta \doteq 1.85$ rads

2. Determine the arc length needed to construct an angle of 1.46 radians on a circle with a radius equal to 4.5 cm? [APP/2]

$\theta = \frac{\text{arc length}}{\text{radius}}$

$1.46 = \frac{a}{4.5}$

$a = 6.57$

∴ arc length of 6.57 cm

3. If $-108°$ is coterminal to $\angle\vartheta$. Determine the principal angle in radian measure. (Note: express as a fraction of π) [KU3]

$\theta = 252°$

$= \frac{252\pi}{180}$

$= \frac{7\pi}{5}$

4. Determine two angles (one positive, one negative) that are coterminal to each of the following. (Note: express in same units as original) [KU4]

A) $\frac{4\pi}{5}$

$\frac{4\pi}{5} + 2\pi = \frac{14\pi}{5}$

$\frac{4\pi}{5} - 2\pi = \frac{-6\pi}{5}$

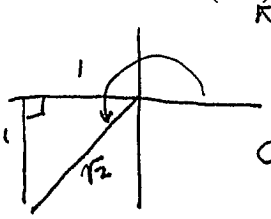
B) 180°

$-180°$

$540°$

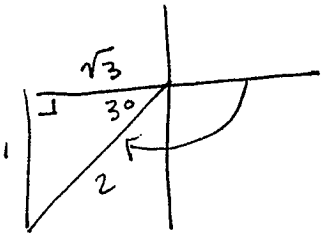
5. Evaluate each of the following using special triangles. (Note: NO DECIMALS ALLOWED, simplify fully for full marks) [A / 4]

A) $\csc\left(\frac{5\pi}{4}\right)$ ← 225°



$\csc\left(\frac{5\pi}{4}\right) = -\sqrt{2}$

B) $\tan\left(\frac{-5\pi}{6}\right)$ ← −150°

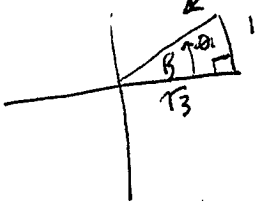


$\tan\left(-\frac{5\pi}{6}\right) = \frac{1}{\sqrt{3}}$

$= \frac{\sqrt{3}}{3}$

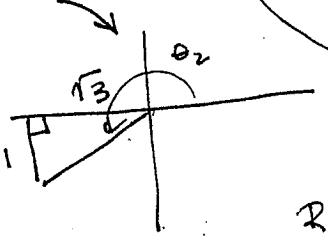
7. Determine the value(s) of x for each of the following. Consider $-2\pi \le x \le 2\pi$. [APP / 6]

A) $\tan x = \frac{1}{\sqrt{3}}$



B

$B = 30°$



$\theta_1 = 30°$

$\theta_2 = 210°$

$\theta_3 = -330°$

$\theta_4 = -150°$

Rads

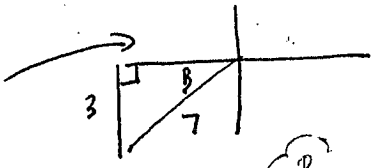
$\theta_1 = \pi/6$

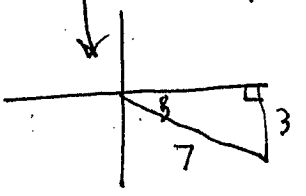
$\theta_2 = 7\pi/6$

$\theta_3 = -\frac{11\pi}{6}$

$\theta_4 = -\frac{5\pi}{6}$

B) $\sin x = -\frac{3}{7}$





B

$B \doteq 25.38°$

$\theta_1 \doteq 205.38°$

$\theta_2 \doteq 334.62°$

$\theta_3 \doteq -154.62°$

$\theta_4 \doteq -25.38°$

Rads

$\theta_1 \doteq 3.58$ rads

$\theta_2 \doteq 5.84$ rads

$\theta_3 \doteq -2.70$ rads

$\theta_4 = -0.44$ rads

8. Determine each of the following for the following function. $y = \frac{1}{2}\sin\left[\frac{1}{3}(x - \frac{\pi}{3})\right] - 8$

[KU / 4]

Amp:	Period:	Phase Shift:	Vert. Shift:
$A = \frac{1}{2}$	$PL = \frac{2\pi}{K}$ $= \frac{2\pi}{(\frac{1}{3})}$ $= 2\pi \times 3$ $= 6\pi$	right $\frac{\pi}{3}$	down 8

9. A) Sketch and fully label one cycle of both functions $y = \cos x$ and $y = -\cos\left(\frac{1}{2}x - \frac{\pi}{2}\right) + 2$ on the graph below. [A5]

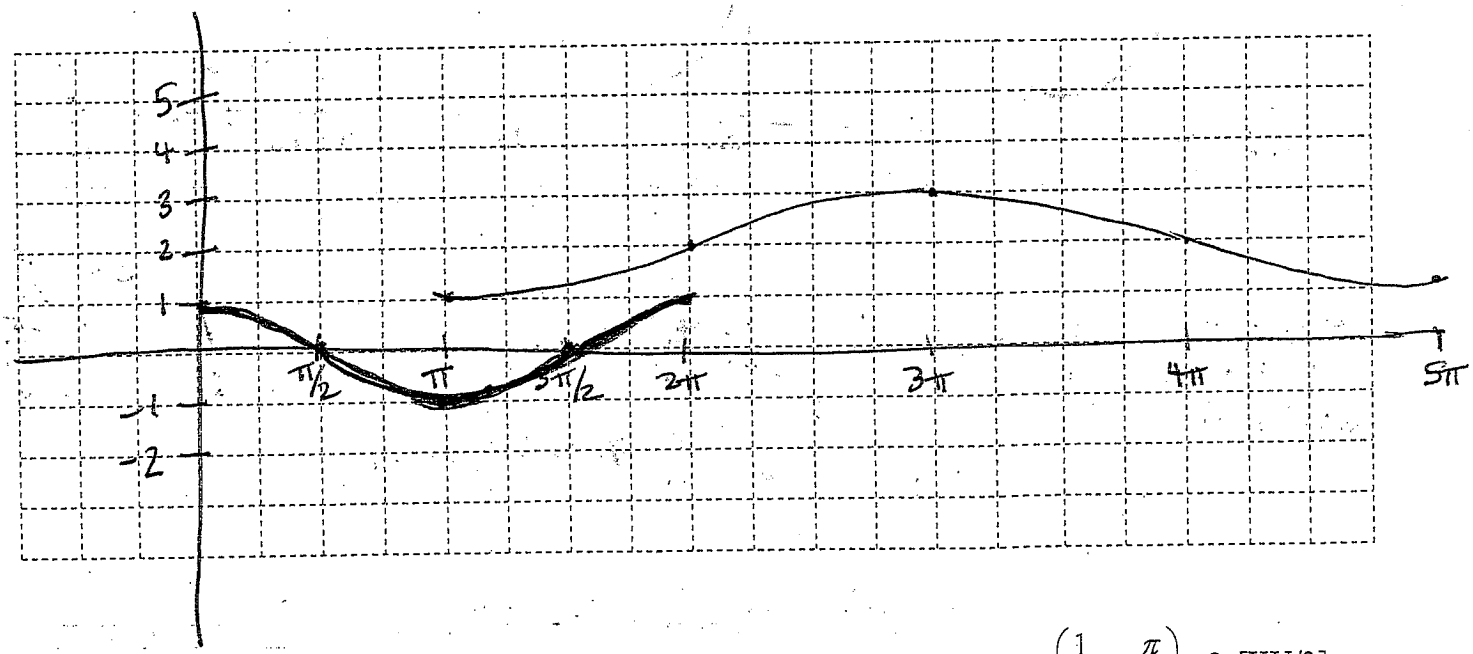
$y = -\cos\left(\frac{1}{2}(\theta - \pi)\right) + 2$

$(\theta, y) \rightarrow (2\theta + \pi, -y + 2)$

$y = \cos\theta$

θ	y
0	1
$\pi/2$	0
π	-1
$3\pi/2$	0
2π	1

θ	y
π	1
2π	2
3π	3
4π	2
5π	1



B) State the Domain, Range and period of the transformed function $y = -\cos\left(\frac{1}{2}x - \frac{\pi}{2}\right) + 2$ [KU/3]

$D = \{\theta \mid \theta \in R\}$

$R = \{y \mid 1 \le y \le 3, y \in R\}$

$PL = \frac{2\pi}{k}$

$= \frac{2\pi}{\frac{1}{2}}$

$= 4\pi$

10. State the period, amplitude of the following trigonometric functions. Then use this information to write the equation of the function. (Note: Assume no phase shift present) [TIPS/3]

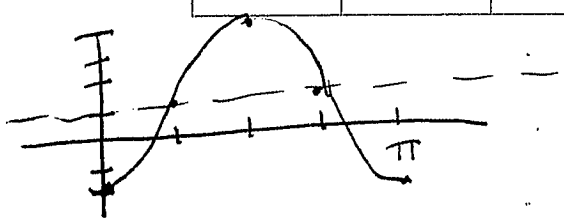
θ	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	π
Y	-2	1	4	1	-2

$PL = \frac{2\pi}{K}$

$K = \frac{2\pi}{PL}$

$K = \frac{2\pi}{\pi}$

$K = 2$

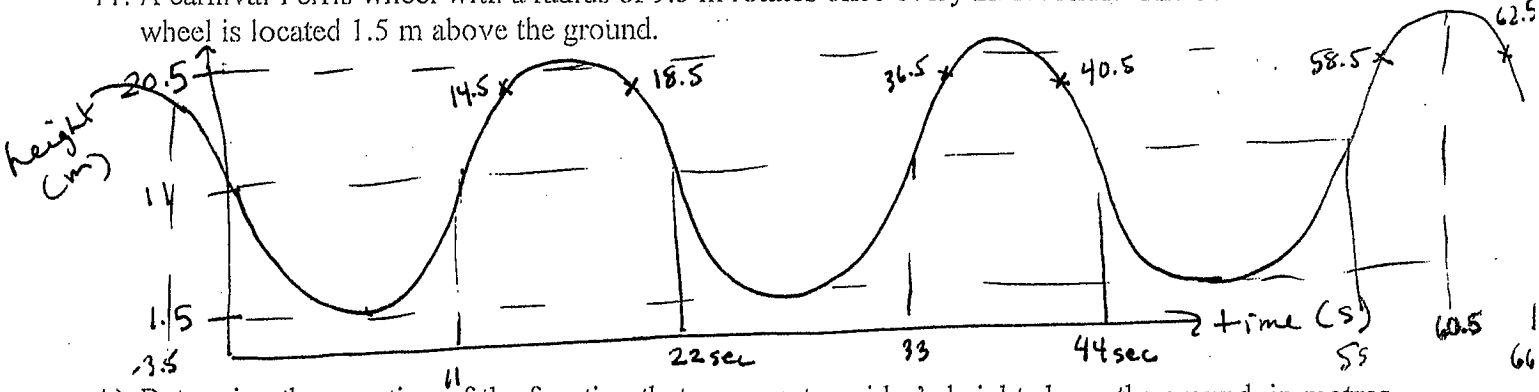


$y = -3\cos(2\theta) + 1$

$PL = \pi$

$Amp = 3$

11. A carnival Ferris wheel with a radius of 9.5 m rotates once every 22 seconds. The bottom of the wheel is located 1.5 m above the ground.



A) Determine the equation of the function that represents a rider's height above the ground, in metres as a function of time, in seconds if the rider starts at a point 11 m above the ground and initially moves in an downward direction. [4]

$K = \frac{2\pi}{PL}$

$= \frac{2\pi}{22}$

$= \pi/11$

$Amp = 9.5$

$PL = 22$

Central $y = 11$

$y = -9.5\sin\left(\frac{\pi}{11}x\right) + 11$

OR

$y = -9.5\cos\left(\frac{\pi}{11}(x - 5.5)\right) + 11$

B) Determine the height of the rider exactly 1 minute into the ride. Is the rider rising or falling at this point in time? [2]

$y = -9.5\sin\left(\frac{\pi}{11}(60)\right) + 11$

$y \doteq 20.40$ m

The rider is at height of 20.4 m and is rising

C) Riders can see Niagara Falls if they are higher than 19 m above the ground. Determine the time intervals within the first 60 seconds that the rider can see the Falls. (This is tricky!!! Caution: CAST Rule!)[4]

$19 = -9.5\sin(\pi/11\, x) + 11$

$x \doteq -3.5$ sec

∴ He can see the falls when the time is

$t \in [14.5, 18.5]$

$t \in [36.5, 40.5]$