(10ths)

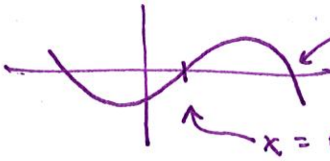
(48pts) → 50pts

Honors Precalculus
Unit 4 Exam (F2015)

Name: MAYO

Part 1 – Calculator Active. Circle final answers.

1. Solve $2\sin(0.5x) = 0.75$ for $\pi < x < 2\pi$.



DEGREES (-1) 316°

$\boxed{x = 5.514}$

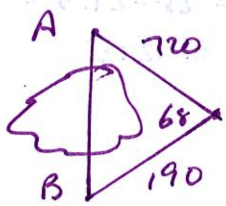
(5.5)

EOC

3 .769 (-1)

EXTRAS (-1)

2. To find the distance between two points A and B on opposite sides of a lake, a surveyor chooses point C which is 720 feet from A and 190 feet from B. If the angle at C measures 68 degrees, find the distance from A to B to the nearest foot. Show work.



$c^2 = 720^2 + 190^2 - 2(720)(190)\cos 68$ (2)

$c^2 = 452007.636$

$c \approx \boxed{672\text{ FT}}$ (1) UNITS ($\frac{1}{2}$)

EOC

NO $\sqrt{\ }$ (-1)

Sin (-2)

3. Find the area of a triangle with side lengths 7 feet, 12 feet, and 8 feet. Show work.

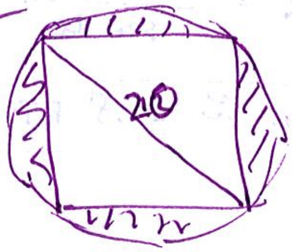
(2)

$A = \sqrt{13.5(13.5-7)(13.5-12)(13.5-8)}$ $s = \frac{1}{2}(7+12+8) = 13.5$

$\boxed{A \approx 26.9\text{ ft}^2}$ (1) UNITS ($\frac{1}{2}$)

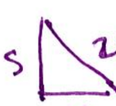
4. A square with diagonal 20 cm long is inscribed inside of a circle. Find the total area of the four regions between the circle and square. Show work.

r = 10 cm



(1) ~~113.04~~ 314.159

$A_{\odot} = \pi(10)^2 = \cancel{36\pi}\ 100\pi$ $A_{\square} = \left(\frac{20}{\sqrt{2}}\right)^2 = \frac{400}{2} = 200$ (1)



$s\sqrt{2} = 20$
$s = \frac{20}{\sqrt{2}}$

or $s^2 + s^2 = 12^2$
$2s^2 = 144$
$s^2 = 72$
$s = \sqrt{72}$

(4)

(1) (1)

~~$A = 36\pi - 72 \approx 41.1\text{ cm}^2$~~ UNITS ($\frac{1}{2}$)

INT ROUNDING ($-\frac{1}{2}$)

$A = 100\pi - 200$ 114.15 cm^2

(14.5)

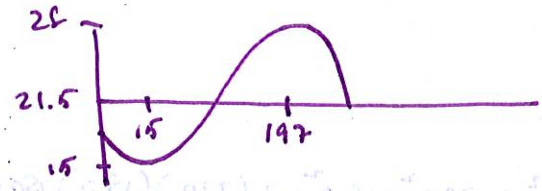
5. The minimum and maximum average temperatures for Orlando, Florida are 15 degrees Celsius and 28 degrees Celsius and they occur on the 15th and 197th days of the year respectively. Write the equation of the sinusoidal function that predicts temperature (T) in degrees Celsius as a function of day of the year (d).

$2\pi/365$ $\quad \frac{\pi}{189.5}$

T(d) = $21.5 - 6.5\cos\left(\frac{2\pi}{365}(d-15)\right)$

1 1 1 1 1 1 6

EOC



$P = 365 \qquad B = \frac{365}{2\pi}$

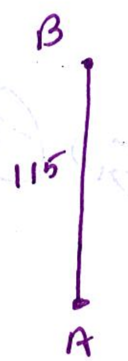
$A = 28 - 21.5 = 6.5$

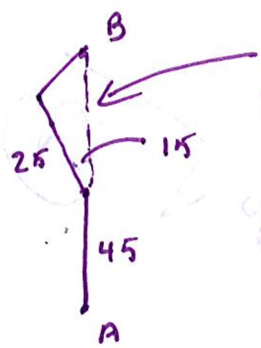
$PS = R\,15$

6. A plane is flying from city A to city B which is 115 miles due north. After flying 45 miles the pilot must change course and fly 15 degrees west of north to avoid a thunderstorm. If the pilot remains on this course for 25 miles, how far will he be from city B? Show work.

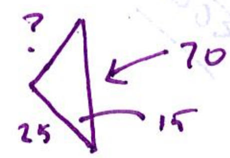
4

EOC





$\begin{array}{r} 115 \\ -45 \\ \hline 70 \end{array}$



$c^2 = 25^2 + 70^2 - 2(25)(70)\cos 15$

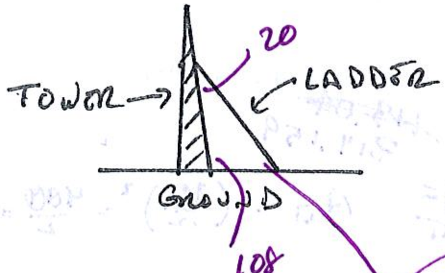
$c^2 = 2144.2596$ UNITS $\frac{1}{2}$

$c \approx \boxed{46.3 \text{ mi}}$ (1)

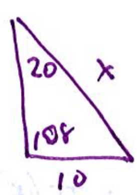
7. You are standing 10 feet from the bottom of a leaning tower. Find the ladder length that is needed to reach the third floor of the tower if the ladder is placed where you are standing. The angle between the tower and the ground is 108 degrees and the angle formed by the ladder and the tower is 20 degrees. Show work.

EOC

3



108 −1



$\frac{\sin 108}{x} = \frac{\sin 20}{10}$ 2

$x = \frac{10\sin 108}{\sin 20}$ UNITS $\frac{1}{2}$

1

$\boxed{x \approx 27.8 \text{ FT}}$

18

Honors Precalculus

Chapter 4 Exam (F2015)

Name:

Part 2 - Calculator inactive. Circle final answers.

8. Solve $4\sin^2 x - 3 = 0$ on the interval $[0, 2\pi)$. Show work.

$\sin^2 x = \frac{3}{4}$

$\sin x = \pm \frac{\sqrt{3}}{2}$ 1

$\boxed{x = \frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}}$ 2 ($\frac{1}{2}$ EACH)

9. Solve $2\sin^2 x - \sin x - 3 = 0$ on the interval $[0, 2\pi)$. Show work.

$(2)(-3) = -6$

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

EOC

$2\sin x(\sin x + 1) - 3(\sin x + 1) = 0$

$(2\sin x - 3)(\sin x + 1) = 0$ 2

$2\sin x = 3$ | $\sin x = -1$

1 $\sin x = \frac{3}{2}$ | $x = \frac{3\pi}{2}$ 1

$\emptyset$

MUST CONSIDER.

10. Verify the identity $\dfrac{\cos x}{1+\sin x} = \sec x - \tan x$

$$\frac{\cos x}{1+\sin x} = \frac{1}{\cos x} - \frac{\sin x}{\cos x}$$

$$\frac{\cos x}{1+\sin x} = \frac{1-\sin x}{\cos x}$$ 3

$$\cos^2 x = (1+\sin x)(1-\sin x)$$

$$\cos^2 x = 1 - \sin^2 x$$

$$\cos^2 x = \cos^2 x \checkmark$$

VOILA! + $\frac{1}{2}$ BONUS

(10)

FOC

11. Using the formula sin(A + B) = sin A cos B + cos A sin B, find sin(7π/12). Show work.

$$\frac{7\pi}{12} = \frac{3\pi}{12} + \frac{4\pi}{12} = \frac{\pi}{4} + \frac{\pi}{3}$$

$$\sin\left(\frac{\pi}{4} + \frac{\pi}{3}\right) = \sin\frac{\pi}{4} \cdot \cos\frac{\pi}{3} + \cos\frac{\pi}{4} \cdot \sin\frac{\pi}{3}$$

$$= \frac{\sqrt{2}}{2} \cdot \frac{1}{2} + \frac{\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2} = \frac{\sqrt{2}}{4} + \frac{\sqrt{6}}{4}$$

3

ACT QUESTION.

12. (Multiple choice). For $0 < x < \pi/2$, the expression $\frac{\sqrt{1-\cos^2 x}}{\sin x} + \frac{\sqrt{1-\sin^2 x}}{\cos x}$ is equivalent to:

a. 0 b. 1 c. 2 d. tan x e. sin 2x

2

$$\frac{\sqrt{\sin^2 x}}{\sin x} + \frac{\sqrt{\cos^2 x}}{\cos x} = \frac{\sin x}{\sin x} + \frac{\cos x}{\cos x} = 1 + 1 = 2$$

→ FOR $0 < x < \pi/2$

13. Given cos x = 3/7, find:

$x = 3 \quad z = 7 \quad 3^2 + y^2 = 7^2$

$9 + y^2 = 49$

$y^2 = 40$

$y = \sqrt{40}$ $= 2\sqrt{10}$

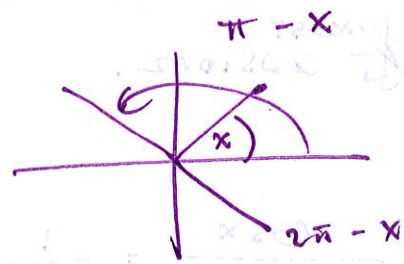
a. cos (-x) = $\frac{3}{7}$

b. sin x = $\sqrt{40}/7$

c. tan x = $\sqrt{40}/3$

$\frac{1}{2}$ EACH

d. sec x = $\frac{7}{3}$



e. cot x = $\frac{3}{\sqrt{40}}$

5.5

f. csc x = $\frac{7}{\sqrt{40}}$

g. sin (-x) = $-\sqrt{40}/7$

h. cos (2π + x) = $\cos x = 3/7$

i. cos(2π – x) = $\frac{3}{7}$

j. cos(π – x) = $-3/7$

k. sin(π/2 – x) = $\cos x = \frac{3}{7}$ (COMPLEMENT)

11.5