Hon Pre-Calculus
Test Chapter 4 Name _____

Circle All Final Answers!! Show All Work For Full Credit!! No Calculators!! Simplify Completely and Leave All Answers in Calculator Ready Form!!

Short Answer

1. Convert 14.36° to degrees, minutes, seconds.

2. Given: $\sec t = \frac{7\sqrt{3}}{3}$, Evaluate:

   a) $\cos(\pi - t)$

   b) $\sec(\pi + t)$

3. Given: $\left(-\frac{\pi}{2} < \theta < \frac{\pi}{2}\right)$ and $\tan\theta = -\frac{12}{5}$ find:

   a) $\csc\theta$

   b) $\sec\theta$

4. Given: $\cot\alpha = \overline{5}$ and $\sin\alpha < 0$ find:

   a) $\sec\alpha$

   b) $\sin\alpha$

5. What are the following exact values:

   a) $\cos\frac{5\pi}{3}$

   b) $\sec\frac{7\pi}{4}$

   c) $\csc\frac{13\pi}{3}$

   d) $\cot\frac{-16\pi}{3}$

6. What is the reference angle of 11.6 radians?

7. Given: $(0 < \theta \leq 2\pi)$. Find all theta that satisfy:

a) $\sec\theta = -2$

b) $-\sqrt{3}\cot\theta - 3 = 0$

8. Consider: $y = 2\sin(4x + \pi) - 3$. State the following:

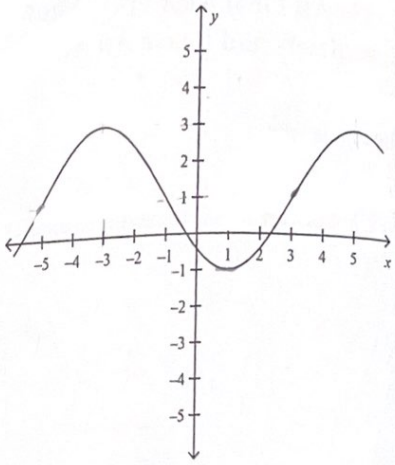
a) Amplitude =

b) Period =

c) Phase Shift =

d) Vertical Shift =

9. Consider the following graph:



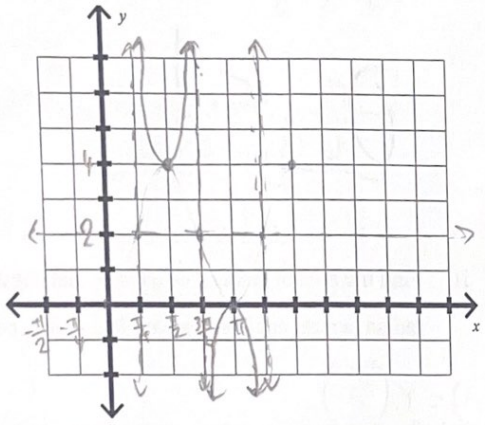
Write a possible function for the graph using **SINE** and $a > 0$.

10. Find the length of the sides of a regular 18 sided polygon inscribed in a circle of radius 10 inches.

11. Consider: $y = 2\sec(2x - \pi) + 2$

a) State the entire domain restrictions.

b) Sketch one cycle of the graph (LABEL, LABEL, LABEL!!!)



12. Researchers find a creature from an alien planet and name it Sheldon. Sheldon's body temperature varies sinusoidally with time. Twenty-five minutes after researchers start timing Sheldon's temperature reaches a high of 150°F. Thirty minutes after that it reaches a low of 92°F.

a) Write an equation of this sinusoid using the SINE function expressing temperature in terms of time.

b) What was the exact temperature of Sheldon's body when the researchers started timing?

13. Find the exact value of the expressions:

a) $\sin\left(\cos^{-1}\left(\frac{\sqrt{5}}{5}\right)\right)$

b) $\sec\left(\sin^{-1}\left(-\frac{\sqrt{2}}{2}\right)\right)$

14. Write an algebraic expression that is equivalent to the expression:

$\tan\left(\arccos\frac{x}{3}\right)$

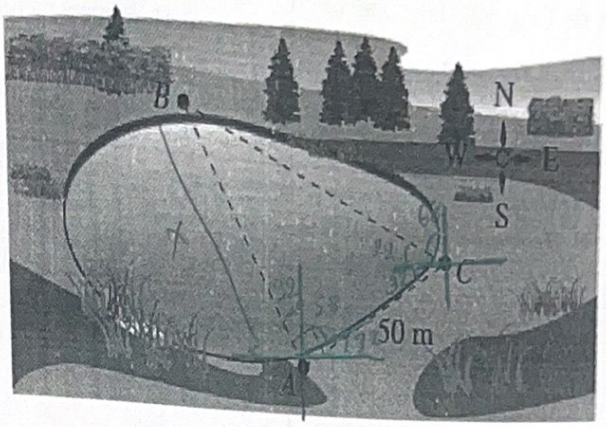
15. Evaluate the expression:

a) $\sin^{-1}\left(\cos\frac{5\pi}{6}\right)$

b) $\tan^{-1}\left(\tan\frac{-5\pi}{6}\right)$

16. Find the area of a sector of a circle that has a $\frac{2\pi}{5}$ radian central angle and an arc length of 2 cm.

17. A surveyor wants to find the distance across a swamp (see figure). The bearing from A to B is N 32° W. The surveyor walks 50 meters from A, and at the point C the bearing to B is N 68° W.

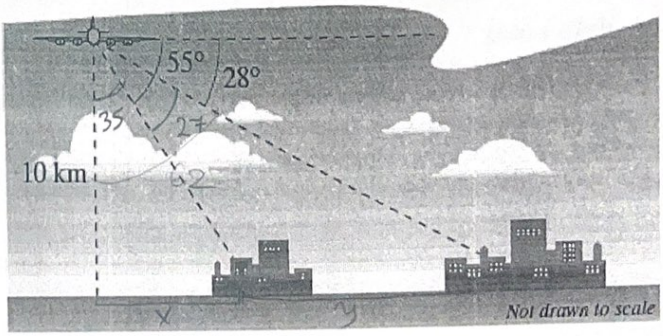


Find:

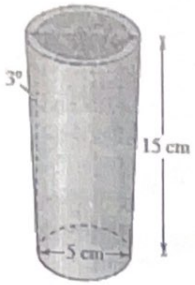
a) The bearing from A to C.

b) The distance from A to B.

18. A passenger in an airplane at an altitude of 10 kilometers sees two towns directly to the east of the plane. The angles of depression to the towns are 28° and 55° (see figure). How far apart are the towns?



19. A tapered shaft has a diameter of 5 cm at the small end and is 15 cm long (see figure). The taper is 3°. Find the diameter d of the large end of the shaft (in calculator ready form).



20. Determine if the function is odd, even, or neither.

a) $f(x) = x + \tan x$

b) $f(x) = x + \sec x$

c) $f(x) = x \csc x$

21. Given: $f(x) = \frac{1}{3}\sec\left(\frac{\pi x}{2} + \frac{\pi}{2}\right) + \frac{2}{3}$

State the domain and range of the f.

a) *Domain* =

b) *Range* =

22. A ship leaves port at noon and has a bearing of $S\ 30^\circ\ W$. The ship sails at 20 knots.

a) How many nautical miles south will the ship sail by 6:00 p.m.?

b) How many nautical miles west will the ship sail by 6:00 p.m.?

c) At 6:00 p.m. the ship changes course to due west. Find the ship's bearing from the port of departure at 7:00 p.m.

Hon Pre-Calculus
Test Chapter 4 Name _____

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Circle All Final Answers!! Show All Work For Full Credit!! No Calculators!! Simplify Completely and Leave All Answers in Calculator Ready Form!!

Short Answer

1. Convert 14.36° to degrees, minutes, seconds.

$0.36 \times 60 = 21.6$

$14°21'36''$

2. Given: $\sec t = \frac{7\sqrt{3}}{3}$, Evaluate:

a) $\cos(\pi - t)$

$-\frac{\sqrt{3}}{7}$

b) $\sec(\pi + t)$

$-\frac{7\sqrt{3}}{3}$

3. Given: $\left(-\frac{\pi}{2} < \theta < \frac{\pi}{2}\right)$ and $\tan\theta = -\frac{12}{5}$ find:

a) $\csc\theta$

$\sin\theta = \frac{-12}{13}$

$12^2 + 5^2 = 144 + 25 = 169 = 13$

$-\frac{13}{12}$

b) $\sec\theta$

$\frac{13}{5}$

4. Given: $\cot\alpha = 5$ and $\sin\alpha < 0$ find:

$\tan\alpha = \frac{1}{5}$

$1^2 + 5^2 = 1 + 25 = 26$

$\sqrt{26}$

a) $\sec\alpha$

$-\frac{\sqrt{26}}{5}$

b) $\sin\alpha$

$\frac{1}{\sqrt{26}} \cdot -\frac{\sqrt{26}}{26}$

5. What are the following exact values:

a) $\cos\frac{5\pi}{3}$ $\frac{1}{2}$

b) $\sec\frac{7\pi}{4}$ $\sqrt{2}$

c) $\csc\frac{13\pi}{3}$

$\csc\frac{\pi}{3} = \frac{2\sqrt{3}}{3}$

d) $\cot\frac{-16\pi}{3}$

$\cot\frac{2\pi}{3}$

$\tan = -\sqrt{3}$

$-\frac{\sqrt{3}}{3}$

6. What is the reference angle of 11.6 radians?

$12.56 - 11.60$

$4\pi - 11.6$

-2

7. Given: $(0 < \theta \leq 2\pi)$. Find all theta that satisfy:

a) $\sec\theta = -2$

$\cos\theta = -\frac{1}{2}$

$\frac{2\pi}{3}, \frac{4\pi}{3}$

b) $-\sqrt{3}\cot\theta - 3 = 0$

$\tan\theta = -\frac{\sqrt{3}}{3}$

$-\sqrt{3}\cot\theta = 3$

$\cot\theta = \frac{-3}{\sqrt{3}} \cdot \frac{\sqrt{3}}{3} = -\sqrt{3}$

$\frac{5\pi}{6}, \frac{11\pi}{6}$

8. Consider: $y = 2\sin(4x + \pi) - 3$. State the following:

$4(x + \frac{\pi}{4})$

$\frac{2\pi}{4} = \frac{\pi}{2}$

a) Amplitude = 2

b) Period = $\frac{\pi}{2}$

c) Phase Shift = $-\frac{\pi}{4}$

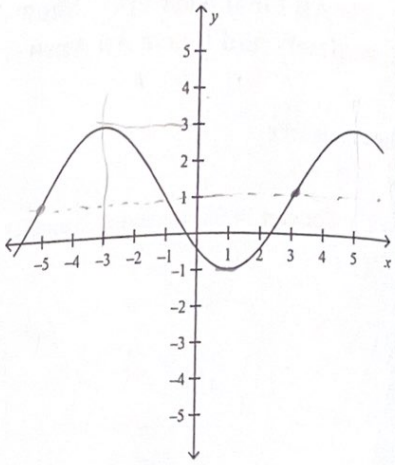
(left $\frac{\pi}{4}$)

d) Vertical Shift = -3

(down 3)

9. Consider the following graph:

$\frac{2\pi}{8} = \frac{\pi}{4}$



Write a possible function for the graph using **SINE** and $a > 0$.

$y = 2\sin\left(\frac{\pi}{4}(x-3)\right) + 1$

10. Find the length of the sides of a regular 18 sided polygon inscribed in a circle of radius 10 inches.

$360 \div 18 = 20$

$\sin 10 = \frac{x}{10}$

$x = 10\sin 10$

$20\sin 10$ in

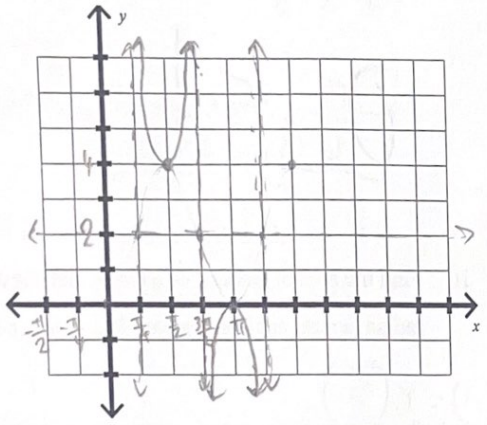
$\frac{2\pi}{2} = \pi$ $\quad 2(x - \frac{\pi}{2})$ $\quad c$ $\quad 1$ $\quad 29 + 92 = 121$ $\quad b = \frac{2\pi}{60} = \frac{\pi}{30}$ $\quad per = 2(30) = 60$ $\quad \frac{58}{2} = 29$

11. Consider: $y = 2\sec(2x - \pi) + 2$

a) State the entire domain restrictions.

$(-\infty, \infty)$, $x \neq \frac{\pi}{4} + \frac{\pi}{2}n$, n int

b) Sketch one cycle of the graph (LABEL, LABEL, LABEL!!!)

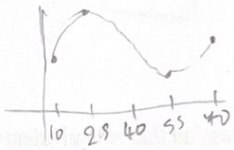


12. Researchers find a creature from an alien planet and name it Sheldon. Sheldon's body temperature varies sinusoidally with time. Twenty-five minutes after researchers start timing Sheldon's temperature reaches a high of 150°F. Thirty minutes after that it reaches a low of 92°F.

a) Write an equation of this sinusoid using the SINE function expressing temperature in terms of time.

$y = 29\sin\left(\frac{\pi}{30}(t - 10)\right) + 121$

$150 - 121 = 29$



b) What was the exact temperature of Sheldon's body when the researchers started timing?

$y = 29\sin\left(\frac{\pi}{30}(0 - 10)\right) + 121$

$y = 29\sin\left(-\frac{10\pi}{30}\right) + 121$

$y = 29\sin\left(-\frac{\pi}{3}\right) + 121$

$y = 29\left(-\frac{\sqrt{3}}{2}\right) + 121$

$y = -\frac{29\sqrt{3}}{2} + 121$

$-\frac{29\sqrt{3}}{2} + 121\ ^\circ F$

13. Find the exact value of the expressions:

a) $\sin\left(\cos^{-1}\left(\frac{\sqrt{5}}{5}\right)\right)$

$(\sqrt{5})^2 + x^2 = 5^2$

$x = \sqrt{25-5}$

$x = \sqrt{20} = 2\sqrt{5}$

$\frac{2\sqrt{5}}{5}$

b) $\sec\left(\sin^{-1}\left(-\frac{\sqrt{2}}{2}\right)\right)$

$\sec\left(-\frac{\pi}{4}\right)$

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

$\sqrt{2}$

14. Write an algebraic expression that is equivalent to the expression:

$\tan\left(\arccos\frac{x}{3}\right)$

$x^2 + y^2 = 9$

$y = \sqrt{9-x^2}$

$\frac{x}{\sqrt{9-x^2}}$ = $\frac{x}{\sqrt{9-x^2}}$

$\frac{x\sqrt{9-x^2}}{9-x^2}$ -2

15. Evaluate the expression:

a) $\sin^{-1}\left(\cos\frac{5\pi}{6}\right)$

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

b) $\tan^{-1}\left(\tan\frac{-5\pi}{6}\right)$

$\tan^{-1}\left(-\frac{\sqrt{3}}{3}\right)$

$-\frac{\pi}{6}$ -1

16. Find the area of a sector of a circle that has a $\frac{2\pi}{5}$ radian central angle and an arc length of 2 cm.

$2 = r\left(\frac{2\pi}{5}\right)$

$\frac{2}{1} \times \frac{5}{2\pi} = \frac{5}{\pi} = r$

$A = \frac{1}{2}r^2\theta$

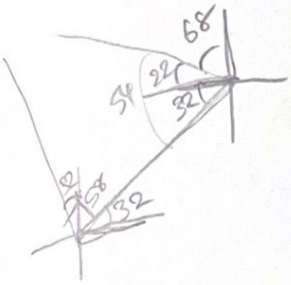
$A = \frac{1}{2}\left(\frac{5}{\pi}\right)^2\left(\frac{2\pi}{5}\right)$

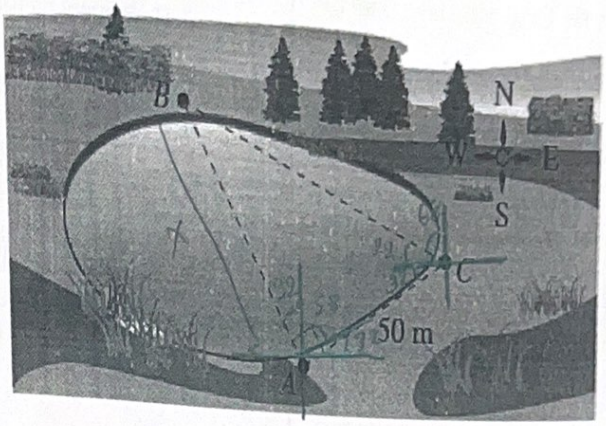
$A = \frac{1}{2}\left(\frac{25}{\pi^2}\right)\left(\frac{2\pi}{5}\right)$

$A = \left(\frac{25}{\pi^2}\right)\left(\frac{\pi}{5}\right) = \frac{5}{\pi}$ -3

$\frac{5}{\pi}$ in^2

17. A surveyor wants to find the distance across a swamp (see figure). The bearing from A to B is N 32° W. The surveyor walks 50 meters from A, and at the point C the bearing to B is N 68° W.





$\tan 54 = \frac{x}{50}$

$x = 50\tan 54$

$22 + 32 = 54$

Find:

a) The bearing from A to C.

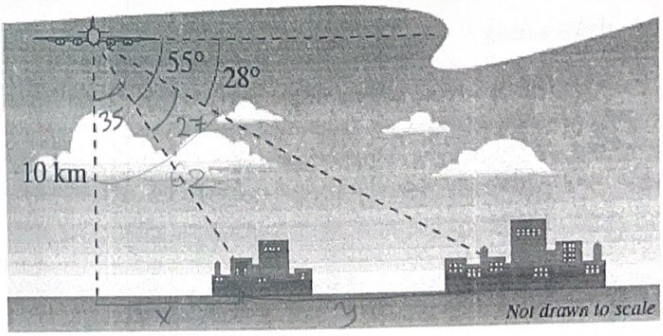
N 58° E

b) The distance from A to B.

$50\tan 54$ m

18. A passenger in an airplane at an altitude of 10 kilometers sees two towns directly to the east of the plane. The angles of depression to the towns are 28° and 55° (see figure). How far apart are the towns?

$35 + 27 = 62$



$\tan 35 = \frac{x}{10}$

$\tan 62 = \frac{x+y}{10}$

$x = 10\tan 35$

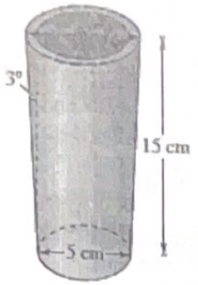
$x = 10\tan 62 - y$

$10\tan 35 = 10\tan 62 - y$

$y = 10\tan 62 - 10\tan 35$

$10\tan 62 - 10\tan 35$ km

19. A tapered shaft has a diameter of 5 cm at the small end and is 15 cm long (see figure). The taper is 3°. Find the diameter d of the large end of the shaft (in calculator ready form).



$\tan 3 = \frac{x}{15}$

$x = 15\tan 3$

$5 + 30\tan 3$ cm

20. Determine if the function is odd, even, or neither.

a) $f(x) = x + \tan x$

$f(-x) = -x + \tan(-x)$

$f(-x) = -(x + \tan x)$

odd

b) $f(x) = x + \sec x$

$f(-x) = -x + \sec(-x)$

$f(-x) = -x + \sec x$

neither

c) $f(x) = x\csc x$

$f(-x) = (-x)(\csc(x))$

$f(-x) = (-x)(-\csc x)$

$f(-x) = x\csc x$

even

21. Given: $f(x) = \frac{1}{3}\sec\left(\frac{\pi x}{2} + \frac{\pi}{2}\right) + \frac{2}{3}$

$\frac{\pi}{2}(x+1)$

$\frac{2}{3} + \frac{1}{3} = 1$

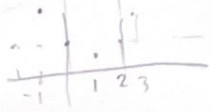
$\frac{2}{3} - \frac{1}{3} = \frac{1}{3}$

State the domain and range of the f.

a) *Domain* = $(-\infty, \infty)$, $x \neq 2n$, n int

b) *Range* = $(-\infty, \frac{1}{3}] \cup [1, \infty)$

$\frac{2\pi}{\frac{\pi}{2}} = 4$



22. A ship leaves port at noon and has a bearing of $S\ 30°\ W$. The ship sails at 20 knots.

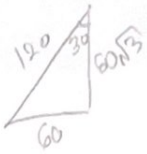
a) How many nautical miles south will the ship sail by 6:00 p.m.?

$20 \times 6 = 120$

$\cos 30 = \frac{a}{120}$

$a = 120\cos 30$

$a = 120\left(\frac{\sqrt{3}}{2}\right) = 60\sqrt{3}$ naut. miles



b) How many nautical miles west will the ship sail by 6:00 p.m.?

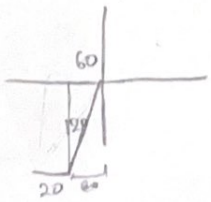
$\sin 30 = \frac{x}{120}$

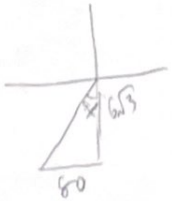
$x = 120\sin 30$

$x = 120\left(\frac{1}{2}\right) = 60$

60 nautical miles

c) At 6:00 p.m. the ship changes course to due west. Find the ship's bearing from the port of departure at 7:00 p.m.





$\tan\theta = \frac{60\sqrt{3}}{80} = \frac{3\sqrt{3}}{4}$

$\tan x = \frac{80}{60\sqrt{3}} = \frac{4}{3\sqrt{3}} = \frac{4\sqrt{3}}{9}$

$S\ \tan^{-1}\left(\frac{4\sqrt{3}}{9}\right)° W$