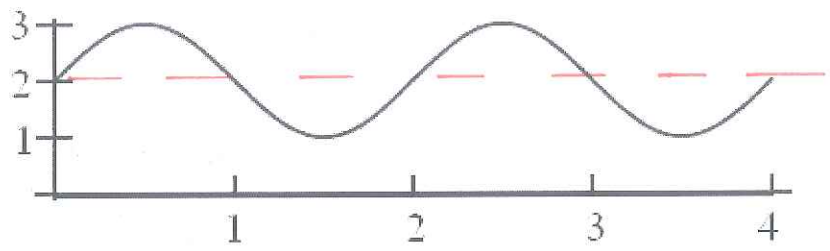
Chapter 7 Review Name: _____

All answers must be justified with work. No work, no credit!

1. Estimate the period of the following periodic function.

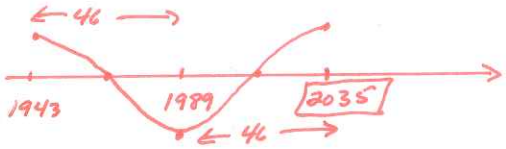


Period = 2

2. Suppose $f(a) = 2b$ and $f(2a) = 5b$. What is $f(4a)$ if f is periodic with period $2a$? Your answer will have b in it.

If period = $2a$, then $2a, 4a, 6a\ldots$ will all have the same values, so $f(4a) = f(2a) = \boxed{5b}$

3. An animal population in a national park dropped from a high of 232,000 in 1943 to a low of 89,000 in 1989, and has risen since then. Scientists hypothesize that the population follows a sinusoidal cycle affected by predation and other environmental conditions, and that the caribou will again reach their previous high. Predict the next year when the population will again be 232,000.



1989 − 1943 = 46 years

1989 + 46 = $\boxed{2035}$

4. Suppose the table below is for a periodic function f with period 3:

x	0	1	2	3
$f(x)$	3	6	10	3

Evaluate $f(86)$.

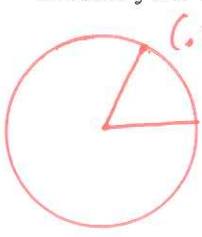
$86 \div 3 = 28\ 2/3$

$3 \times 28 = 84$

$\ldots$ 84	85	86
3	6	10

$\boxed{f(86) = 10}$

5. If the x-value for the point on the unit circle with angle α° is 0.31, find $\cos\alpha$ and $\sin\alpha$. Round your answers to three decimal places, if necessary.



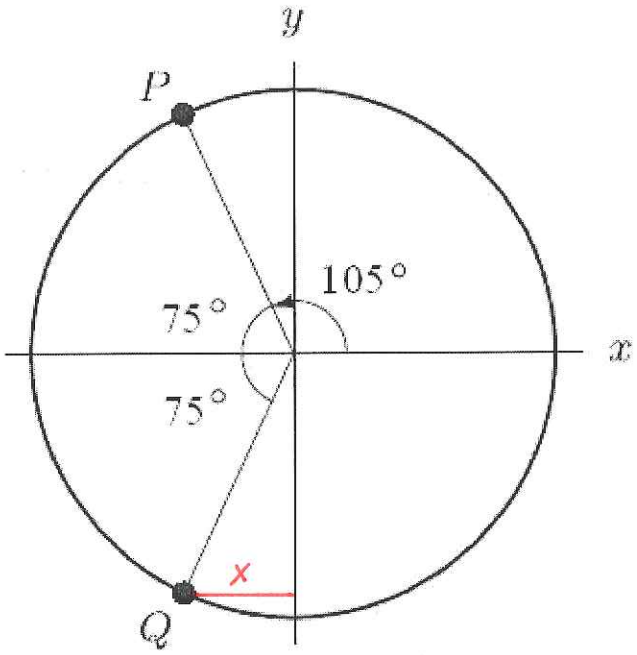
$\cos\theta = .31$

$\theta = \cos^{-1}(.31)$

$\sin\theta = \sin(\cos^{-1}(.31))$

$\boxed{\sin\theta = .951}$

6. In the following figure, the circle shown is the unit circle. What is the horizontal distance from Q to the $y-$axis? Round to 2 decimal places.



$x = \cos\theta$

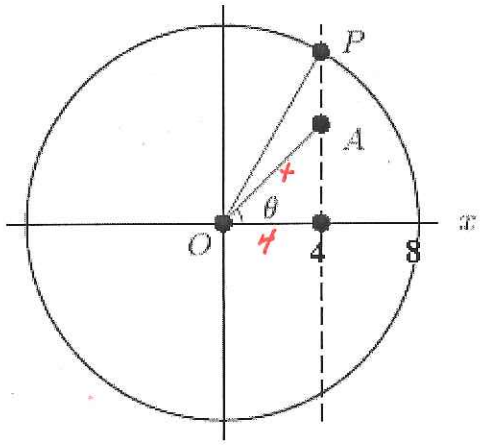
$= \cos(180+75)$

$= \cos(255°)$

$= -.2588$

$x = .26$ (Negative is ignored as it is a distance.)

7. In the following figure, what is the length of segment $\overline{OA}$?



$\cos\theta = \frac{a}{h}$

$\cos\theta = \frac{4}{x}$

$\frac{\cos\theta}{1} = \frac{4}{x}$

$x\cos\theta = 4 \cdot 1$

$x\cos\theta = 4$

$x = \frac{4}{\cos\theta}$

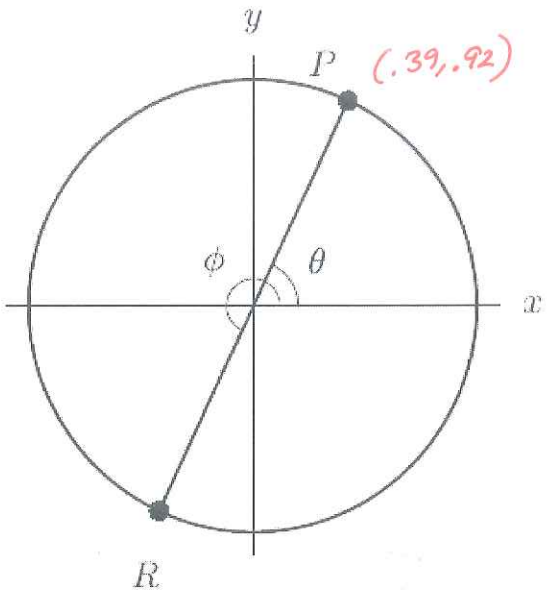
A) $\frac{4}{\cos\theta}$

B) $\frac{4}{\sin\theta}$

C) $4\cos\theta$

D) $4\sin\theta$

8. In the following figure, the coordinates of P are (0.39, 0.92). The angle $\phi =$ _____°. Round to the nearest whole number.



$x = \cos\theta$

$.39 = \cos\theta$

$\theta = \cos^{-1}(.39)$

$\theta = 67.046^\circ$

$\theta \approx 67^\circ$

$\phi = 180^\circ + 67^\circ$

$\boxed{\phi = 247^\circ}$

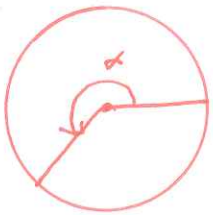
9. If angle α lies in Quadrant III, name the quadrant in which the following angles lie :

A) $90^\circ + \alpha$ IV

B) $270^\circ - \alpha$ I

C) $720^\circ + \alpha$ III

D) $-180^\circ + \alpha$ I



10. The midline of the periodic function $y = 2\cos(3x) - 4$ is $y =$ _____.

Amplitude = 2

Midline: $y = -4$

11. What is the amplitude of the periodic function $y = 2\cos(2x) - 8$?

Amplitude = 2

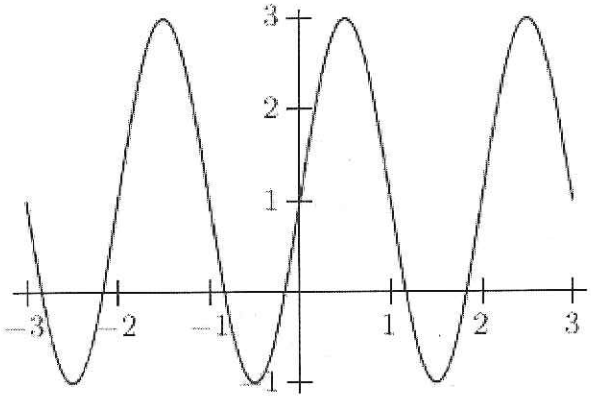
12. Find an angle α between 0° and 180° such that $\cos\alpha = \sin 150^\circ$.

$\sin 150^\circ = \frac{1}{2}$

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

$\theta = \cos^{-1}\left(\frac{1}{2}\right) = \boxed{60^\circ}$

13. The midline of the periodic function shown below is $y =$ 1.



14. The coordinates of the point on a circle of radius 3.5 at the angle 330° are (3.031 , -1.75). Round each coordinate to 3 decimal places.

$x = r\cos\theta \quad y = r\sin\theta$

$= 3.5\cos 330^\circ \quad = 3.5\sin 330^\circ$

$x = 3.031 \quad y = -1.75$

15. Is the period of $\cos(x/2)$ greater than, less than, or the same as the period of $\tan(x/2)$?

A) the same
B) greater
C) less

$\frac{360}{\pi/2} \qquad \frac{180}{\pi/2}$

$360 \cdot \frac{2}{\pi} \qquad 180 \cdot \frac{2}{\pi}$

$\frac{720}{\pi} \qquad \frac{360}{\pi}$

16. Without a calculator, find the exact value of $\tan 225^\circ$. If it is undefined, enter "undefined".

$\tan 225^\circ = \frac{-\sqrt{2}/2}{-\sqrt{2}/2}$

$\tan 225^\circ = 1$

or

$\tan 225 = \tan(45+180)$

$= \tan 45^\circ$

$= 1$

17. Find the exact value of the following without a calculator. If it is undefined, enter "undefined".

A) $\tan 270^\circ$
B) $\tan 225^\circ = 1$
C) $\tan 30^\circ$

$\tan 270^\circ = \frac{-1}{0}$

undefined

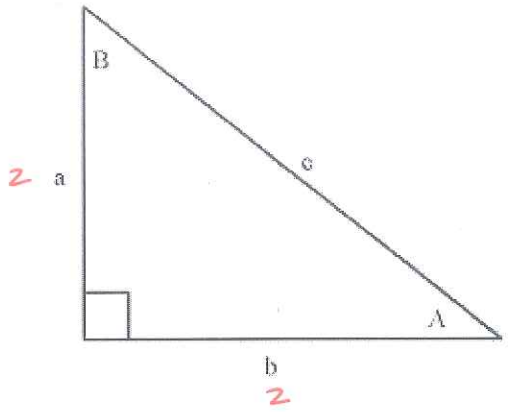
$\tan 30^\circ = \frac{1/2}{\sqrt{3}/2}$

$= \frac{1}{2} \cdot \frac{2}{\sqrt{3}}$

$= \frac{1}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$

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

18. Find the following exactly using the figure given if $a = 2$ and $b = 2$.



$2^2 + 2^2 = c^2$

$4 + 4 = c^2$

$8 = c^2$

$\sqrt{8} = c$

A) $\sin A^\circ = \frac{2}{\sqrt{8}} \cdot \frac{\sqrt{8}}{\sqrt{8}} = \frac{2\sqrt{8}}{8} = \boxed{\frac{\sqrt{8}}{4}}$

B) $\cos A^\circ = \frac{2}{\sqrt{8}} \cdot \frac{\sqrt{8}}{\sqrt{8}} = \frac{2\sqrt{8}}{8} = \boxed{\frac{\sqrt{8}}{4}}$

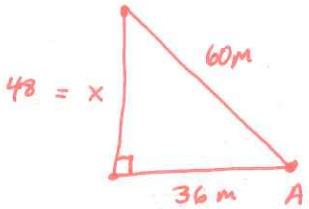
C) $\tan A^\circ = \frac{2}{2} = \boxed{1}$

D) $\sin B^\circ = \frac{2}{\sqrt{8}} = \boxed{\frac{\sqrt{8}}{4}}$

E) $\cos B^\circ = \frac{2}{\sqrt{8}} = \boxed{\frac{\sqrt{8}}{4}}$

F) $\tan B^\circ = \frac{2}{2} = \boxed{1}$

19. Two ships start at the same port. Ship A travels due east at 12 mph. Ship B travels due north. After 3 hours, the ships are 60.00 miles apart. How fast was ship B traveling? Round your answer to the nearest whole number.



$36^2 + x^2 = 60^2$

$1296 + x^2 = 3600$

$x^2 = 2304$

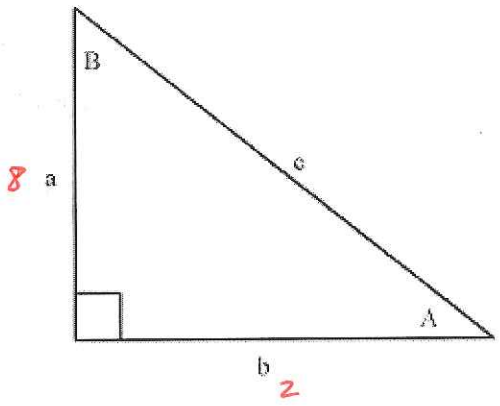
$x = 48$

$d = rt$

$48 = r(3)$

$\boxed{16 \text{ m/h} = r}$

20. If $a = 8$ and $b = 2$, find the following. Give your answers to 3 decimal places.



$c^2 = 2^2 + 8^2$

$c^2 = 4 + 64$

$c^2 = 68$

$c = \sqrt{68}$

$c = 8.246$

$\tan A = \frac{8}{2}$

$\tan A = 4$

$A = \tan^{-1}(4)$

$A = 75.964^\circ$

$B = 90^\circ - 75.964^\circ$

$B = 14.036^\circ$

A) c
B) A
C) B

21. Evaluate the following. Give answers to 4 decimal places.

A) $\cos^{-1} x, \quad x = 0.58$

B) $(\sin x)^{-1}, \quad x = 40^\circ$

C) $\tan x, \quad x = 50^\circ$

$\cos^{-1}(.58) = 54.5495^\circ$

$(\sin 40^\circ)^{-1} = \frac{1}{\sin 40^\circ} = 1.5557$

$\tan 50^\circ = 1.1918$

22. Solve for θ, an angle in a right triangle, if $5\cos(2\theta) + 6 = 2\cos(2\theta) + 7$. Give the answer correct to 3 decimal places.

$3\cos(2\theta) + 6 = 7$

$3\cos(2\theta) = 1$

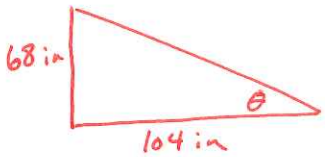
$\cos(2\theta) = \frac{1}{3}$

$2\theta = \cos^{-1}\left(\frac{1}{3}\right)$

$2\theta = 70.52878$

$\theta = 35.264^\circ$

23. A 68 inch tall man casts a 104 inch long shadow. What is the angle θ of the sun? Give your answer to 3 decimal places.



$\tan\theta = \frac{68}{104}$

$\theta = \tan^{-1}\left(\frac{68}{104}\right)$

$\theta = 33.179^\circ$

24. Solve for θ, an angle in a right triangle, if $\cos(3\theta - 14) + 6 = 7$. Round your answer to 3 decimal places.

$\cos(3\theta - 14) = 1$

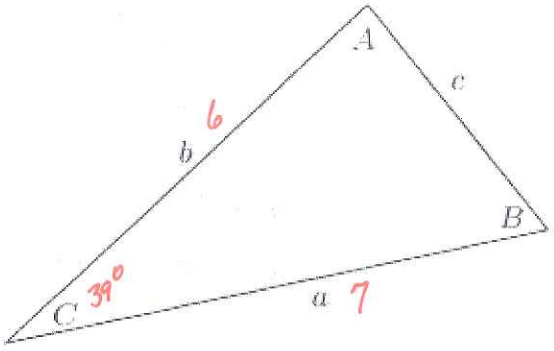
$3\theta - 14 = \cos^{-1}(1)$

$3\theta - 14 = 0$

$3\theta = 14$

$\theta = 4.667^\circ$

25. Use the figure below to find the missing side, c, when $a = 7$, $b = 6$, and $C = 39^\circ$. Round to 4 decimal places.



$c^2 = a^2 + b^2 - 2ab\cos C$

$c^2 = 7^2 + 6^2 - 2(7)(6)\cos 39^\circ$

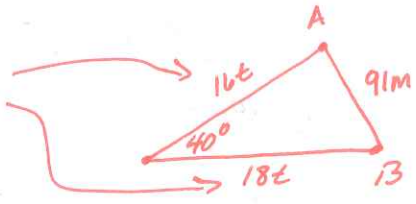
$c^2 = 49 + 36 - 84\cos 39^\circ$

$c^2 = 19.71973924$

$c = 4.4407$

26. Two ships leave port and head out to sea in straight lines at 1pm. It is noted that they are travelling away from each other at an angle of 40°. Ship A travels at 16 miles per hour and Ship B travels at 18 miles per hour. After how many hours are they 91 miles apart?

$d = rt$



$91^2 = (18t)^2 + (16t)^2 - 2(18t)(16t)\cos 40^\circ$

$8281 = 324t^2 + 256t^2 - 576t^2\cos 40^\circ$

$8281 = 580t^2 - 576t^2\cos 40$

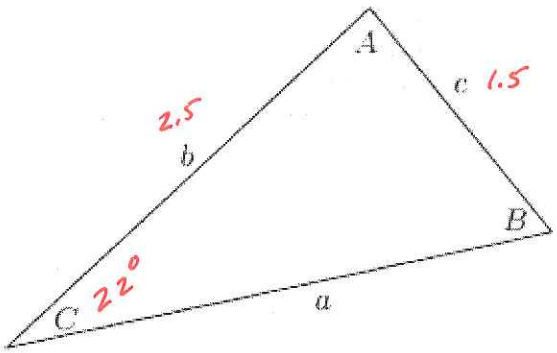
$8281 = 580t^2 - 441.2415992t^2$

$8281 = 138.7584008t^2$

$59.67922695 = t^2$

$7.725 \text{ hours} = t$

27. In the following figure, suppose $c = 1.5$, $b = 2.5$, and $C = 22^\circ$. Find A, and round your answer to two decimal places. If there are two possible answers, list both.



$\frac{\sin 22^\circ}{1.5} = \frac{\sin B}{2.5}$

$1.5 \sin B = 2.5 \sin 22^\circ$

$\sin B = \frac{2.5 \sin 22^\circ}{1.5}$

$B = \sin^{-1}\left(\frac{2.5 \sin 22^\circ}{1.5}\right)$

$B_1 = 38.634^\circ$

or

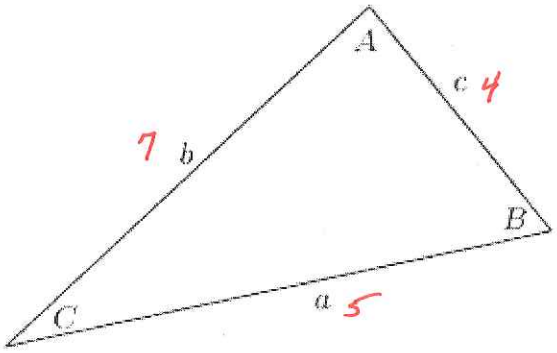
$B_2 = 180 - 38.634$

$B_2 = 141.366^\circ$ * It is possible as $141.366^\circ + 22^\circ < 180^\circ$

$A_1 = 180 - 22 - 38.634^\circ = \boxed{119.37^\circ}$

$A_2 = 180 - 22 - 141.366^\circ = \boxed{16.63^\circ}$

28. Find the angles of the triangle if $a = 5$, $b = 7$ and $c = 4$. Round to two decimal places.



$b^2 = a^2 + c^2 - 2ac \cos B$

$7^2 = 5^2 + 4^2 - 2(5)(4) \cos B$

$49 = 25 + 16 - 40 \cos B$

$49 = 41 - 40 \cos B$

$8 = -40 \cos B$

$-\frac{8}{40} = \cos B$

$B = \cos^{-1}\left(-\frac{1}{5}\right)$

$B = 101.536959$

$\boxed{B = 101.54^\circ}$

$\frac{\sin 101.536959}{7} = \frac{\sin A}{5}$

$7 \sin A = 5 \sin 101.536959$

$\sin A = \frac{5 \sin 101.536959}{7}$

$A = \sin^{-1}\left(\frac{5 \sin 101.536959}{7}\right)$

$\boxed{A = 44.42^\circ}$

$C = 180^\circ - 101.536959 - 44.41531$

$\boxed{C = 34.05^\circ}$