Pre Calculus
Review 4B (4.4-4.8)

Name: KEY
Block: _____

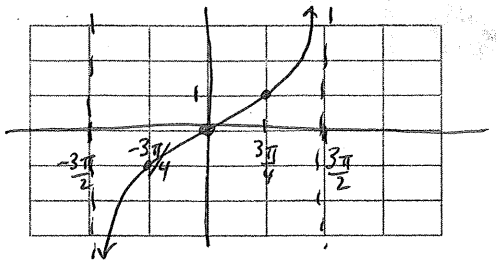
Non-Calculator

Show all work for credit!!

Graph each function without a calculator. State the (a) amplitude, (b) period, (c) phase shift and (d) vertical shift. Label each axis.

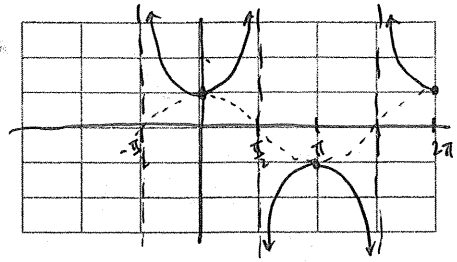
1. $y = \tan\left(\frac{x}{3}\right)$

a) N/A
b) Period $= 3\pi$
c) NO p.s. d) no v.s.



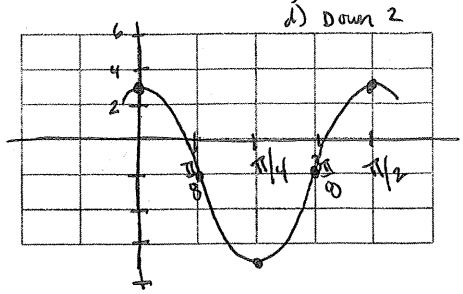
2. $y = \sec x$

a) N/A
b) Per $= 2\pi$
c) no p.s. d) no v.s.



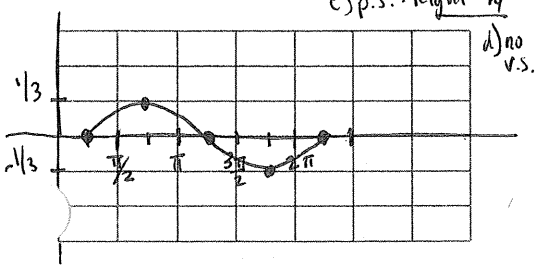
3. $y = 5\cos(4x) - 2$

a) amp $= 5$
b) per $= \pi/2$
c) no p.s.
d) Down 2



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

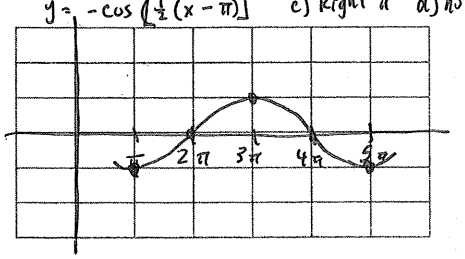
a) amp $= 1/3$
b) Per $= 2\pi$
c) p.s.: Right $\pi/4$
d) no v.s.



5. $y = -\cos\left(\frac{x}{2} - \frac{\pi}{2}\right)$

a) amp $= 1$ (flipped)
b) per $= 4\pi$
c) Right π d) no v.s.

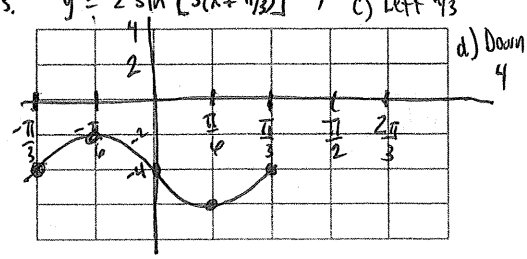
$y = -\cos\left[\frac{1}{2}(x - \pi)\right]$



6. $y = 2\sin(3x + \pi) - 4$

a) amp $= 2$
b) per $= 2\pi/3$
c) Left $\pi/3$
d) Down 4

$y = 2\sin\left[3(x + \pi/3)\right] - 4$



7. Write the equation(s) of the cosine function with amplitude 5, period 3π, phase shift $-\frac{\pi}{6}$, and vertical shift of 1.

$b = \frac{2\pi}{b}$
$3\pi = \frac{2\pi}{b}$
$b = 2/3$

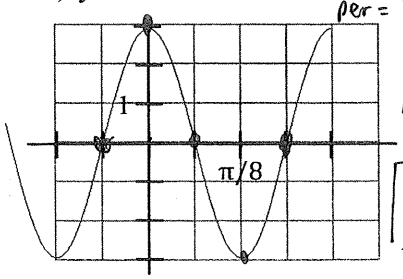
Left $\pi/6$

$y = 5\cos\left[\frac{2}{3}(x + \pi/6)\right] + 1$

8. Write the equation of the function shown below using the given parent function…

a) $y = \sin x$

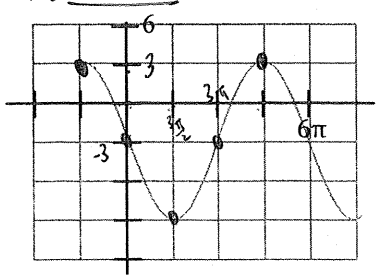
amp $= 3$
per $= \pi/4 = \frac{2\pi}{b}$
$8 = b$
Left $\pi/16$



$y = 3\sin\left[8\left(x + \frac{\pi}{16}\right)\right]$

b) $y = \cos x$

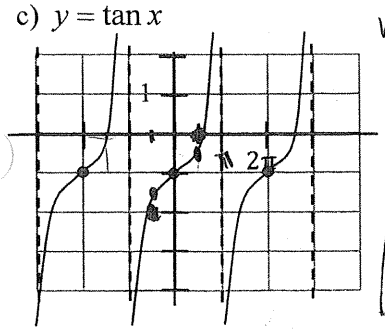
amp $= 6$ Down 3
per $= 6\pi = \frac{2\pi}{b}$
$\frac{1}{3} = b$
Left $\frac{3\pi}{2}$



$y = 6\cos\left[\frac{1}{3}\left(x + \frac{3\pi}{2}\right)\right] - 3$

c) $y = \tan x$

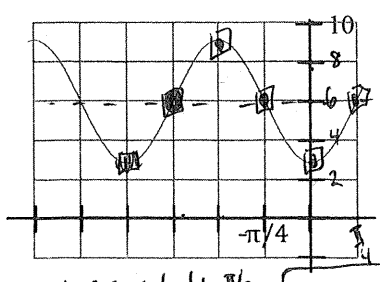
vertical shrink by $1/2$
Period $= 2\pi = \frac{\pi}{b}$
$\frac{1}{2} = b$
Down 1



$y = \frac{1}{2}\tan\left(\frac{1}{2}x\right) - 1$

d) $y = \sin x$ **and** $y = \cos x$

amp $= 3$ Up 6
per $= \pi = \frac{2\pi}{b}$
$2 = b$
$y = \sin x$: Left $\pi/4$ (flipped)



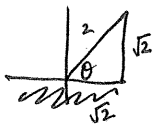
$y = -3\sin\left[2\left(x + \frac{\pi}{4}\right)\right] + 6$

$y = \cos x$: Left $\pi/2$

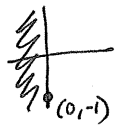
$y = 3\cos\left[2(x + \pi/2)\right] + 6$

Find the exact value. Express your angle answers in radian measure.

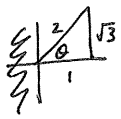
9. $\cos^{-1}\left(\frac{\sqrt{2}}{2}\right) = \frac{\pi}{4}$



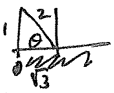
10. $\sin^{-1}(-1) = -\pi/2$



11. $\arctan\left(\sqrt{3}\right) = \pi/3$



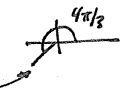
12. $\sin\left[\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)\right]$



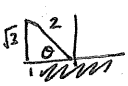
$\sin\left(\frac{5\pi}{6}\right)$

$\frac{1}{2}$

13. $\cos^{-1}\left[\cos\left(\frac{4\pi}{3}\right)\right]$



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



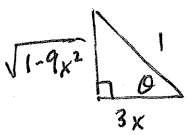
$\frac{2\pi}{3}$

14. $\arcsin\left[\tan\left(\frac{3\pi}{4}\right)\right]$

$\arcsin(-1)$

$-\pi/2$

15. Find an algebraic expression equivalent to $\sin(\arccos 3x)$.

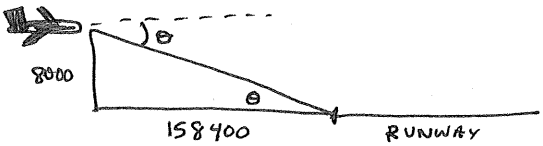


$= \sin(\theta)$

$= \sqrt{1-9x^2}$

Calculator Allowed

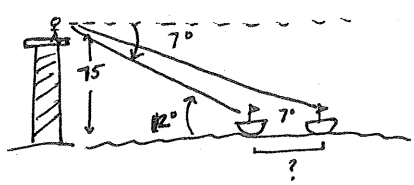
16. A plane is 8000 feet above the ground when it begins its final approach to a runway. If the ground distance to the end of the runway is 158400 feet, what is the angle of descent to the end of the runway?



$\tan\theta = \frac{8000}{158400}$

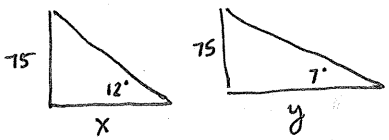
$\theta = \tan^{-1}\left(\frac{8000}{158400}\right) \approx 2.891°$

17. Two boats are observed from a tower 75 meters above a lake. The angles of depression are 12° and 7°. How far apart are the boats?



$\tan 12° = \frac{75}{x}$ $\qquad$ $\tan 7° = \frac{75}{y}$

$x = \frac{75}{\tan 12°}$ $\qquad$ $y = \frac{75}{\tan 7°}$



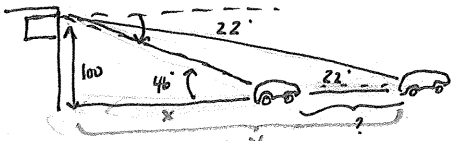
$\frac{75}{\tan 7°} - \frac{75}{\tan 12°} \approx 257.9787239$

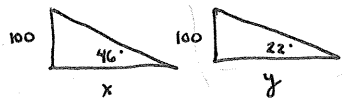
want $y - x$

≈ 257.979 m apart

18. From the Penthouse Suite in 100 ft tall hotel, a woman observes a car speeding recklessly away from the entrance to the hotel. If the angle of depression from the woman to the car changes from 46° to 22° while she is observing, find each of the following…

a) How far did the car travel away while the woman was watching?





$\tan 46° = \frac{100}{x}$ $\quad x = \frac{100}{\tan 46°}$

$\tan 22° = \frac{100}{y}$ $\quad y = \frac{100}{\tan 22°}$

b) How far was the car from the entrance to the hotel?

WANT $y - x$

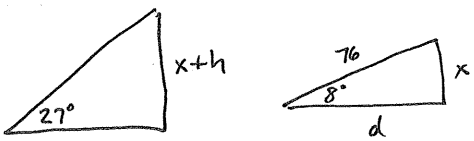
$y - x = \frac{100}{\tan 22} - \frac{100}{\tan 46} \approx 150.9398079$

≈ 150.940 feet

at beginning… $x \approx \frac{100}{\tan 46°} \approx 96.569$ feet

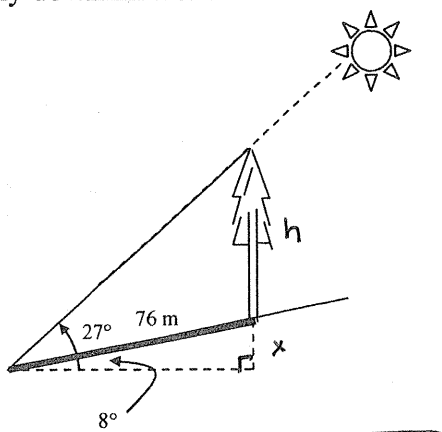
at end… $y \approx \frac{100}{\tan 22°} \approx 247.509$ feet

19. A certain tree grows vertically on a hill which makes an angle of 8° with the horizontal. When the angle of elevation of the sun is 27°, the end of the tree's shadow is 76 meters directly downhill from the base of the tree. Find the height of the tree.



$\cos 8° = \frac{d}{76}$ $\quad \sin 8° = \frac{x}{76}$

$76\cos 8° = d$ $\quad 76\sin 8° = x$



$\tan 27° = \frac{x+h}{76\cos 8°}$

$\tan 27° = \frac{76\sin 8° + h}{76\cos 8°}$

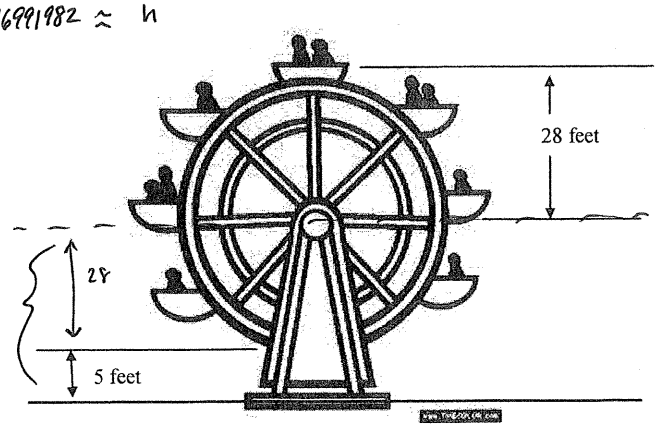
$76\cos 8°\tan 27° = 76\sin 8° + h$

$76\cos 8°\tan 27° - 76\sin 8° = h$

$27.76991982 \approx h$

Tree ≈ 27.770 feet

20. The Ferris wheel shown makes one complete turn every 30 seconds. A rider's height, h, above the ground can be modeled by a trigonometric equation $h = a\sin(\omega t) + k$, where h and k are given in feet and t is in seconds. Write the equation.



$k = 33$ $\quad$ Per = 30 sec $= \frac{2\pi}{\omega}$

$\omega = \frac{2\pi}{30} = \pi/15$

amp = 28

$h = 28\sin\left(\frac{\pi}{15}t\right) + 33$