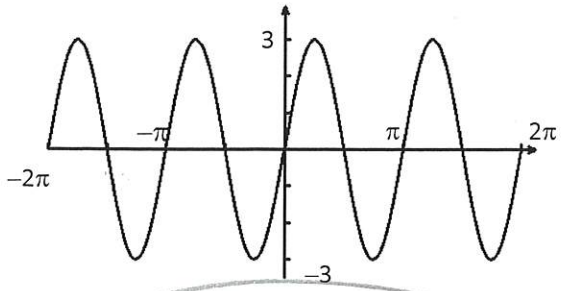
Precalculus
Section 4.5 – 4.8

Name Key
Period _____ Date _____

Write an equation of each graph.

period = π $\pi = \frac{2\pi}{b}$ b = 2
amp: 3

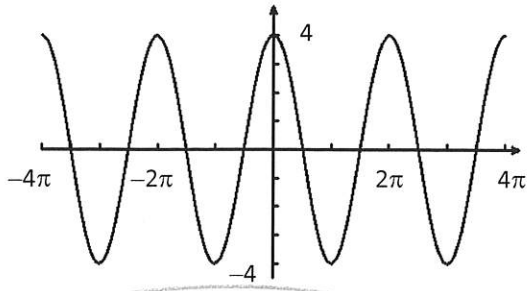
1.



$y = 3\sin 2x$

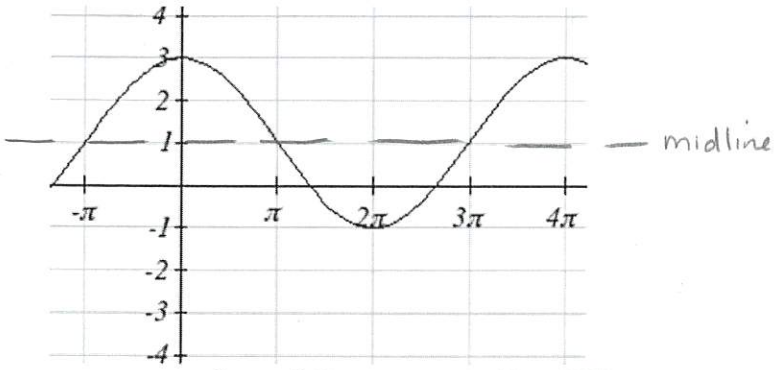
period = 2π
amp: 4

2.



$y = 4\cos x$

3.



midline

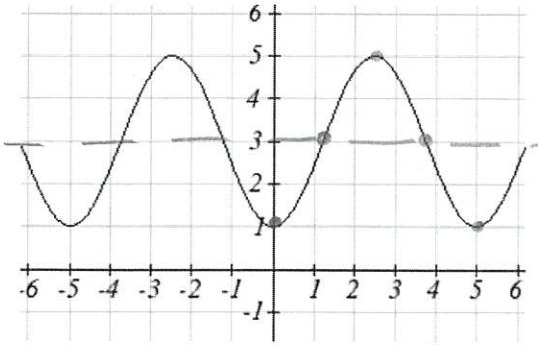
amp: 2
period: 4π

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

b = 1/2

$y = 2\cos \frac{1}{2}x + 1$

4.



midline

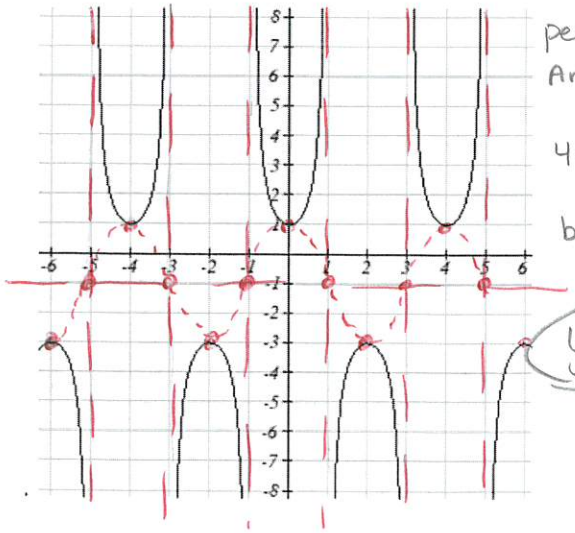
Amp: 2
period = 5

$5 = \frac{2\pi}{b}$

$b = \frac{2\pi}{5}$

$y = -2\cos \frac{2\pi}{5} + 3$

5.



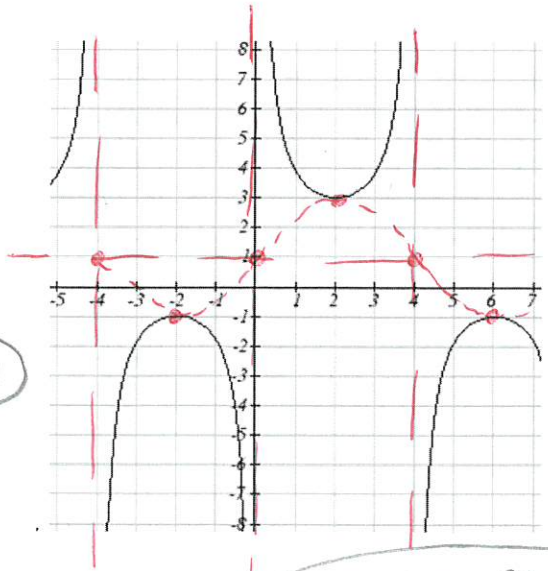
period: 4
Amp: 2

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

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

$y = 2\sec \frac{\pi}{2}x - 1$

6.



Amp: 2
period: 8

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

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

$y = 2\csc \frac{\pi}{4}x + 1$

Sketch the graph of each function showing at least two periods.

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

period : $\frac{2\pi}{b} = \frac{2\pi}{2} = \pi$

phase shift

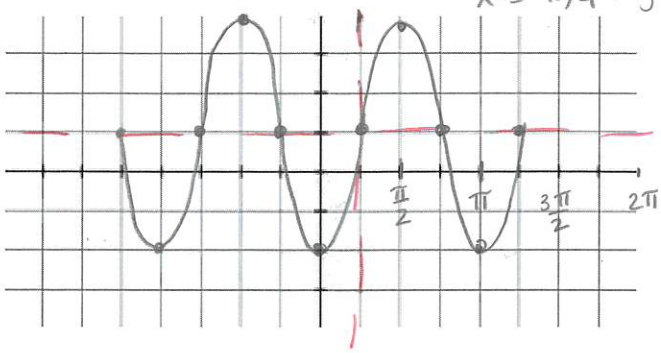
$2x - \frac{\pi}{2} = 0$

$2x = \pi/2$

$x = \pi/4$ Right

up 1

amp: 3



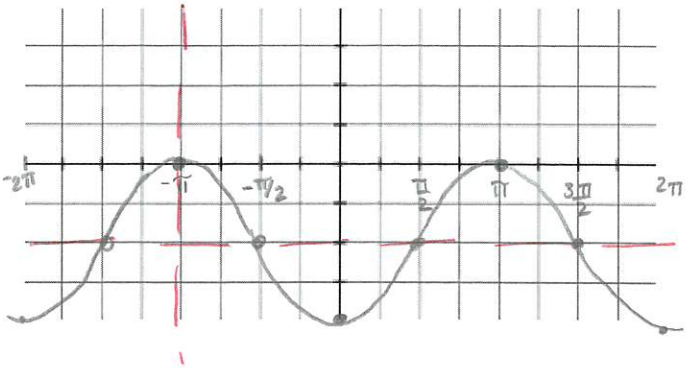
8. $y = 2\cos(x + \pi) - 2$

amp: 2

period 2π

Left π

down 2



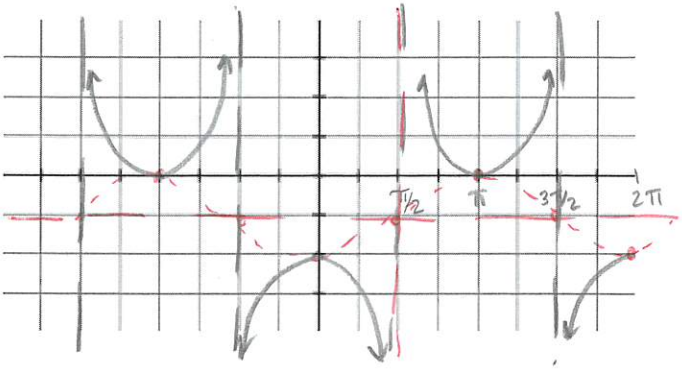
9. $y = \csc\left(x - \frac{\pi}{2}\right) - 1$

amp: 1

period 2π

Right $\pi/2$

down 1



10. $y = 3\sec(2x - \pi) + 2$

Amp 3

period π

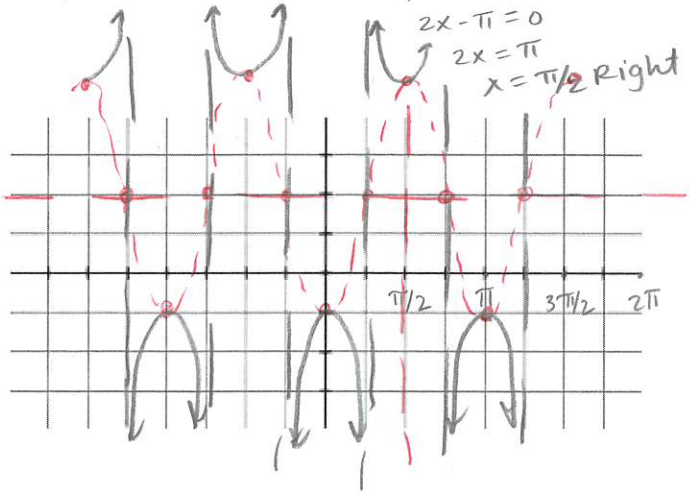
phase shift

$2x - \pi = 0$

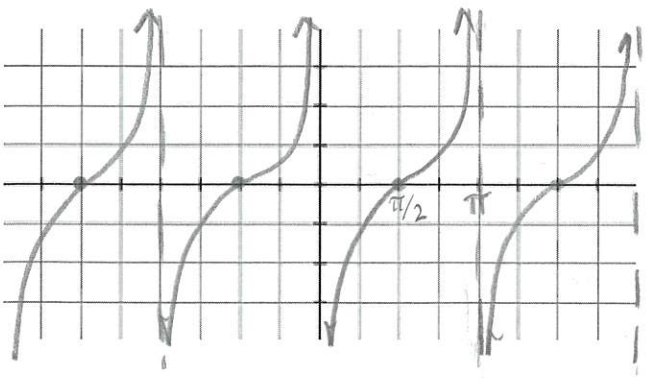
$2x = \pi$

$x = \pi/2$ Right

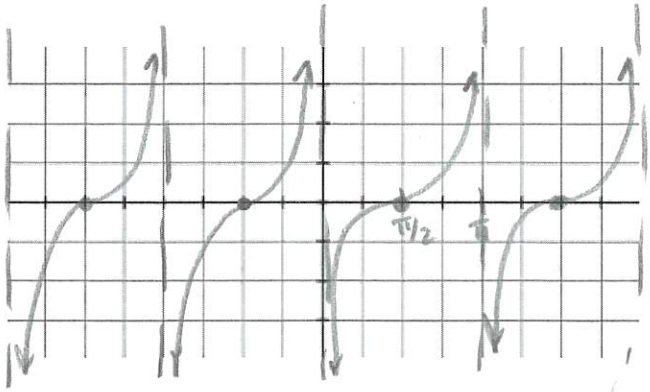
up 2



11. $y = -4\cot x$



12. $y = \tan\left(x + \frac{\pi}{2}\right)$ left $\pi/2$



The graph of each function in questions 13-16 oscillates between two parallel lines. Find the equations of the two lines and graph the lines and the function in the same viewing window.

13. $y = 2x + \cos x$ (Amp 1)

$y = 2x + 1$

$y = 2x - 1$

14. $y = 1 - 0.5x + \cos 2x$ (Amp 1)

$y = -.05x + 1 + 1 \Rightarrow y = -.05x + 2$

$y = -.05x + 1 - 1 \Rightarrow y = -.05x$

15. $y = 2 - 0.3x + \sin x$ (Amp 1)

$y = -.3x + 2 + 1 \Rightarrow y = -.3x + 3$

$y = -.3x + 2 - 1 \Rightarrow y = -.3x + 1$

16. $y = 1 + x + \sin 3x$ (Amp 1)

$y = x + 1 + 1 \Rightarrow y = x + 2$

$y = x + 1 - 1 \Rightarrow y = x$

Tell whether the function exhibits damped oscillation. If so, identify the damping factor and tell whether the damping occurs as $x \to 0$ or as $x \to \infty$.

17. $f(x) = e^{-x} \sin 3x$

yes

$x \to \infty$

damping factor e^{-x}

18. $f(x) = x \sin 4x$

yes

$x \to 0$

damping factor x

19. $f(x) = \sqrt{5} \cos 1.2x$

NO

20. $f(x) = \pi^2 \cos \pi x$

NO

21. $f(x) = x^3 \sin 5x$

yes damping factor x^3

$x \to 0$

22. $f(x) = \left(\frac{2}{3}\right)^2 \sin\left(\frac{2x}{3}\right)$

NO

Decide whether the following functions are classified as a sinusoid. State the period of each.

23. $y = 2 \sin 5x - 3 \cos 2x$

$\frac{2\pi}{5}$ $\frac{4\pi}{5}$ $\frac{6\pi}{5}$ $\frac{8\pi}{5}$ $\frac{10\pi}{5}$

No sinusoid

$\frac{2\pi}{2}$ π, 2π, 3π

Period: 2π

24. $f(x) = 2 \cos \pi x + \sin \pi x$

yes sinusoid

Period: 2

25. $y = 2 \cos x + \cos 3x$

2π 4π 6π

No sinusoid

Period: 2π

$\frac{2\pi}{3}$ $\frac{4\pi}{3}$ $\frac{6\pi}{3}$

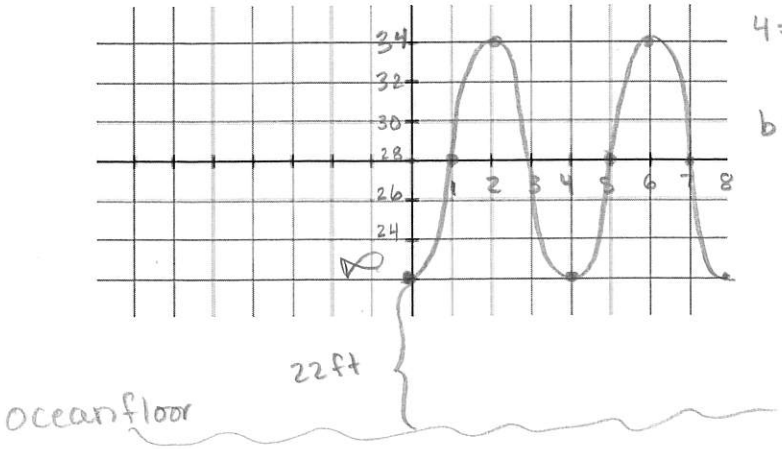
26. $f(x) = 4 \cos x + 2 \sin x$

yes sinusoid

Period: 2π

27. A particular ocean wave measures 12 feet from the top of the peak to the bottom of the trough. The bottom of each trough is 22 feet above the sea floor. It takes 4 seconds for each peak of the wave to pass by a certain point on the ocean floor. Tina the Tuna is letting the waves bob her up and down in the water. Sketch the graph and answer the following questions.

p = 4 seconds Amp: 6



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

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

a. If she starts her ride on the bottom of a trough, write an equation modeling her height from the sea floor.

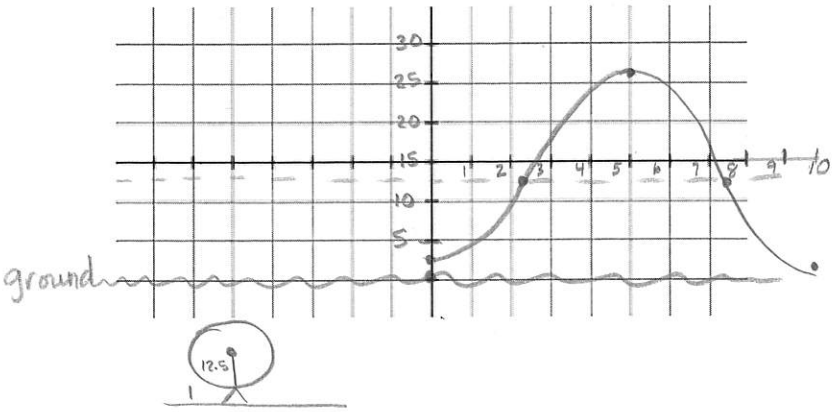
$y = -6\cos\frac{\pi}{2}t + 28$

b. How far from the bottom will Tina be at 9 seconds after she starts her ride?

28ft

28. A Ferris wheel is 25 meters in diameter and boarded from a platform that is 1 meters above the ground. The six o'clock position on the Ferris wheel is level with the loading platform. The wheel completes 1 full revolution in 10 minutes. The function *h(t)* gives your height in meters above the ground in *t* minutes after the wheel begins to turn. Sketch the graph and answer the following questions.

p = 10 minutes $10 = \frac{2\pi}{b}$ $b = \pi/5$



a. Find the amplitude, midline and period of h(t).

amp: 12.5 m period: 10 min

midline: y = 13.5 m

b. Find a formula for the height function h(t).

$h(t) = -12.5\cos\frac{\pi}{5}t + 13.5$

c. How high are you off the ground after 5 minutes? 26 meters

29. From the top of the 100-ft-tall building a man observes a car moving toward the building. If the angle of depression of the car changes from 22° to 46° during the period of observation, how far does the car travel?

$\tan 22° = \frac{100}{w}$ $\tan 46° = \frac{100}{d}$

$w = \frac{100}{\tan 22°}$ $d = \frac{100}{\tan 46°}$

$w = 247.6$ ft $d = 96.6$ ft

$x = w - d$

$x = 247.6 - 96.6$

$x = 151$ ft