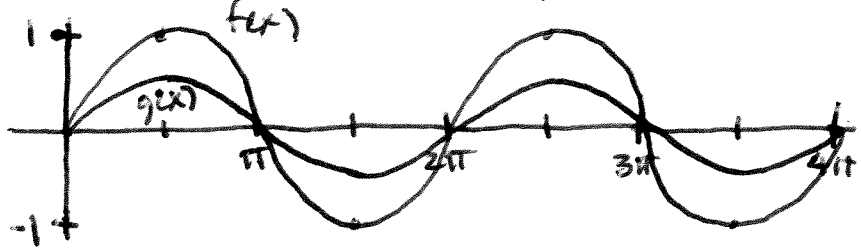
4.4 Assignment (solutions) 1-21 odd, 31-34 all

1) $f(x) = \sin x$

$g(x) = \frac{1}{2}\sin x$

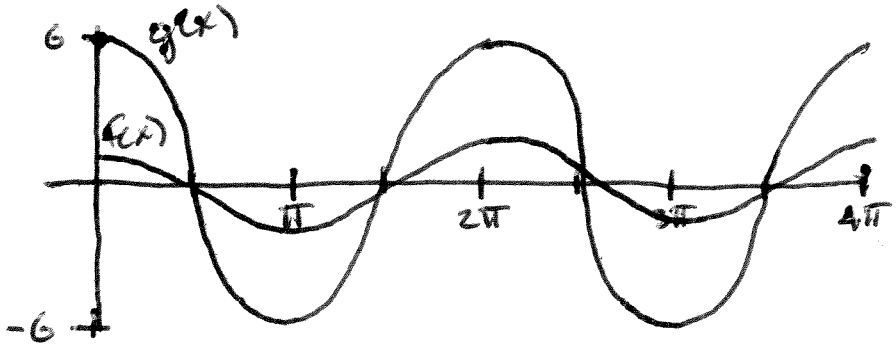
amp $= \frac{1}{2}$



3) $f(x) = \cos x$

$g(x) = 6\cos x$

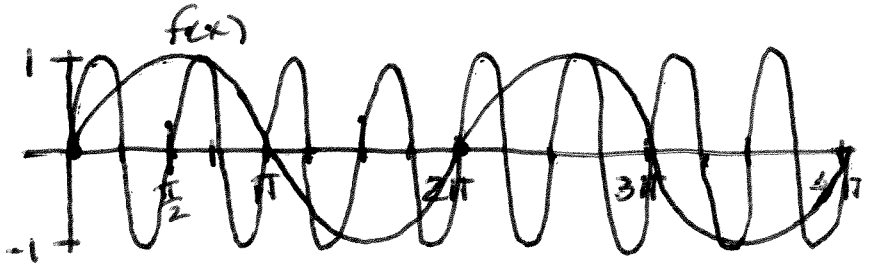
amp $= 6$



5) $f(x) = \sin x$

$g(x) = \sin 4x$

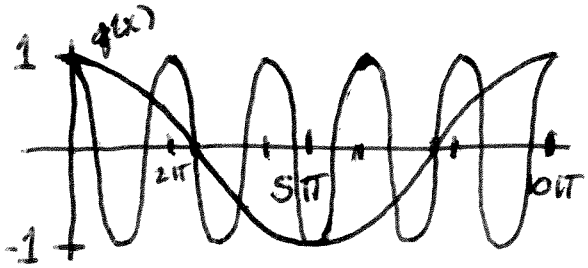
per $= \frac{2\pi}{4} = \frac{\pi}{2}$



7) $f(x) = \cos x$

$g(x) = \cos\frac{x}{5}$

per $= \frac{2\pi}{1/5} = 10\pi$



9) frequency $= \frac{1}{\text{period}} = \frac{b}{2\pi} = 165$

amp $= a = 0.15$ $\quad b = 165 \times 2\pi = 330\pi$

$y = 0.15\sin(330t)$

11) $f = 932 = \frac{b}{2\pi}$

$1864\pi = b \quad a = 0.25$

$y = 0.25\sin(1864\pi t)$

13) $f = 623 = \frac{b}{2\pi}$ $\quad y = 0.2\sin(1246\pi t)$

$1246\pi = b \quad a = 0.2$

15) $y = \cos\left(\frac{x}{3} + \frac{\pi}{2}\right)$ $\quad$ amp = 1

$per = \frac{2\pi}{1/3} = 6\pi$

phase shift $= -\frac{c}{|b|} = -\frac{\pi/2}{1/3} = -\frac{3\pi}{2}$ (left)

no vertical shift

17) $y = \sin(3x) - 2$

amp = 1 $\quad$ period: $\frac{2\pi}{3}$ $\quad$ no phase shift

vertical shift - down 2

19) $y = \sin\left(x + \frac{5\pi}{6}\right) + 4$

amp = 1 $\quad$ period = 2π $\quad$ phase: $-\frac{\frac{5\pi}{6}}{|1|} = -\frac{5\pi}{6}$ (left)

Vert = up 4

21) amp $= \frac{12.95 - 2.02}{2} = \frac{10.93}{2} = 5.465$ ft

a) per = 10:55 − 4:25 = 6:30 × 2 = 13:00 hours $= \frac{2\pi}{b}$ $\quad b = \frac{2\pi}{13}$

Phase = +4:25 or $4.41\overline{6} = -\frac{c}{|b|}$

V. shift = + 5.465 + 2.02 = 7.485 ft

$c = 4.41\overline{6} \times -\frac{2\pi}{13}$

$= -2.13$

b) $y = 5.465\cos\left(\frac{2\pi}{13}x - 2.13\right) + 7.485$

c) $x = 8{:}45 = 8.75$

+12 (pm)

20.75

$\sim$ 7.3 ft

21. TIDES The table shown below provides data for the first high and low tides of the day for a certain bay during one day in June. (Example 7)

Tide	Height (ft)	Time
first high tide	12.95	4:25 A.M.
first low tide	2.02	10:55 A.M.

a. Determine the amplitude, period, phase shift, and vertical shift of a sinusoidal function that models the height of the tide. Let x represent the number of hours that the high or low tide occurred after midnight.

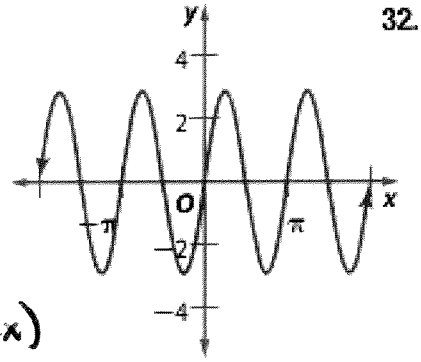
b. Write a sinusoidal function that models the data.

c. According to your model, what was the height of the tide at 8:45 P.M. that night?

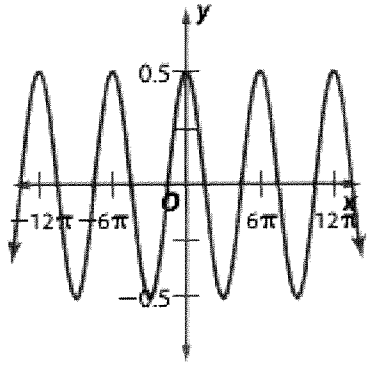
Write an equation that corresponds to each graph.

sin
$a = 3$
$per = \pi = \frac{2\pi}{b}$
$b = 2$
no shifts
$y = 3\sin(2x)$

31.

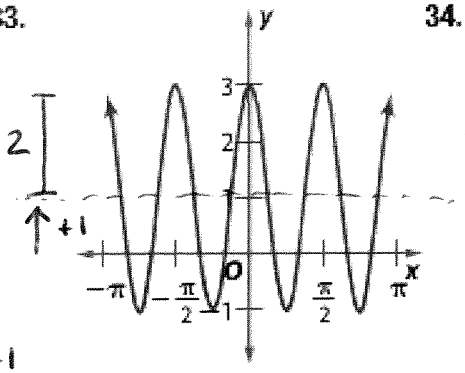


32.



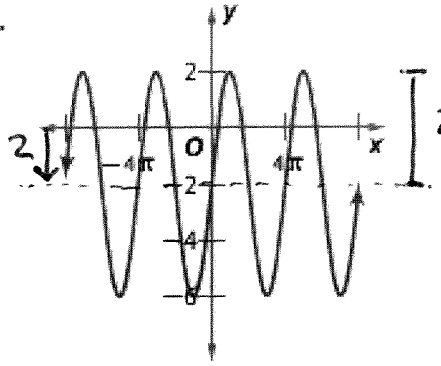
cos $a = 0.5$
$per = 6\pi = \frac{2\pi}{b}$
$b = 1/3$
no shifts
$y = 0.5\cos\frac{1}{3}$

33.



cos
$a = 2$
$period = \frac{\pi}{2}$
$b = 4$
$h.shift = +1$
$y = 2\cos(4x) + 1$

34.



sin
$a = 2$
$per = 4\pi$
$b = 1/2$
$v.shift = -2$
$y = 2\sin\left(\frac{x}{2}\right) - 2$