# §4-8 Translating (or Scaling) Trig. Functions

Identify the following:

| | amplitude | period | vertical translation | phase shift |
|---|---|---|---|---|
| ① $y = \cos\left(x + \frac{\pi}{3}\right)$ | | | | |
| ② $y = \sin(x + \pi) + 3$ | | | | |
| ③ $y = 2\cos\left(x - \frac{\pi}{4}\right) - 1$ | | | | |
| ④ $y = \tan(x - 5) + 2$ | | | | |
| ⑤ $y = 5\sin\left(\frac{x}{4}\right) + 10$ | | | | |

Sketch the following:

⑥ $y = \cos(x - \pi)$     ⑦ $f(t) = 2\sin(t - 2\pi)$     ⑧ $y = \cos\left(x - \frac{\pi}{2}\right) + 1$

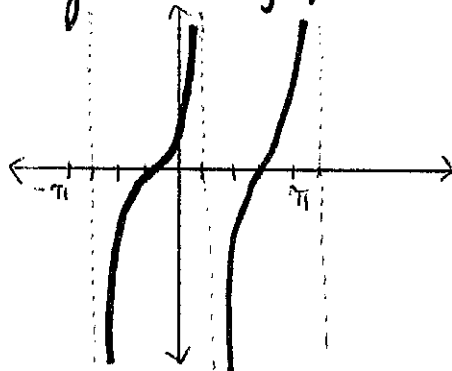⑨ $y = \tan\left(x - \frac{\pi}{6}\right) - 1$     ⑩ $y = 2\sin\left(\frac{\pi}{3} \cdot x\right)$     ⑪ $y = \frac{1}{3}\cos\left(\frac{x}{4}\right)$
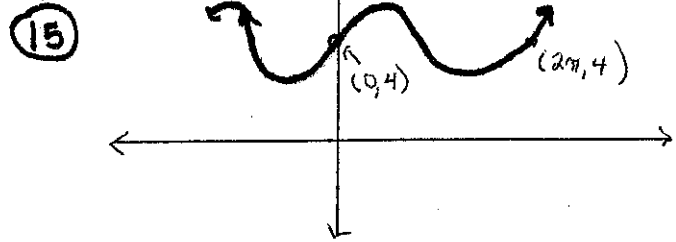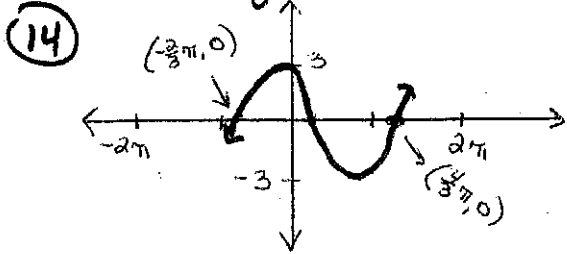
Complete:

⑫ Write an equation of the image of $y = \cos x$ under a phase shift of $-\frac{\pi}{3}$
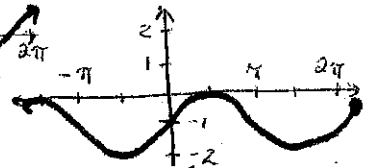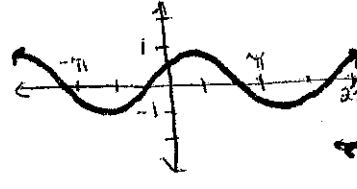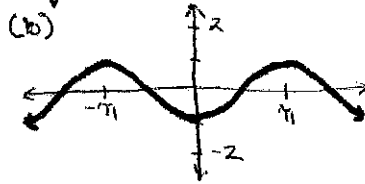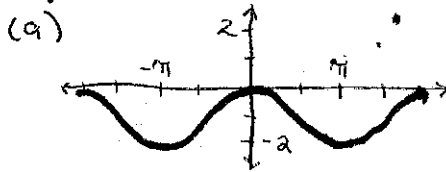
⑬ Write an equation for the image of $y = \tan x$ graphed below.

Write an equation for the function

(14)

$(-\frac{2}{3}\pi, 0)$
$-2\pi$   3   $2\pi$
$-3$
$(\frac{2}{3}\pi, 0)$

(15)

$(0,4)$   $(2\pi, 4)$

Match the equation with the graph

(16) $y = \sin(x + \pi/3)$    (17) $y = \sin(x - \pi/2)$    (18) $y = \sin x - 1$

(a)


(b)






(19) the height in feet of the tide in a harbor is given by $h = 3\cos(\frac{\pi}{6}t) + 19$ where t is the time in hours after high tide.

(a) Find height at $t = 0$, $t = 1$ and $t = 3$ without a calculator (using exact values) Then convert to decimal answer using your calculator

(b) What is the minimum height? Maximum height? Figure out without a calculator, then confirm with a graph made on your calculator. Record the window and sketch.

(c) At what times in a 24 hour period will the minimum height occur? Show how to find without using a calculator and then confirm by analyzing your graph.

(21) Where are the asymptotes of the parent function $y = \tan x$? What is the domain + range? How are these different from the parent functions $y = \sin x$ and $y = \cos x$?

(22) Simplify

(a) $\frac{x-2}{1/3}$

(b) $\frac{x - \pi/2}{1/8}$

(23) Rewrite as $\frac{x-h}{a}$

(a) $2x - 4$

(b) $4x - 2\pi$

(24) If $T(x + 2\pi, y - 5)$, write the equation for this transformation on $y = \sin x$.